

**THE RAILWAY GAZETTE**  
A Journal of Management, Engineering and Operation  
INCORPORATING  
Railway Engineer • TRANSPORT • The Railway Petrol  
The Railway Times • Herapaths Railway Journal  
RAILWAYS ILLUSTRATED • ESTABLISHED 1835 • RAILWAY RECORD.

33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1.

Telephone: WHitehall 9233 (12 lines) Telegrams: "Trazette Parl, London"

## BRANCH OFFICES

GLASGOW: 87, Union Street . . . . . Central 4646  
NEWCASTLE-ON-TYNE: 21, Mosley Street . . . . . Newcastle-on-Tyne 22239  
MANCHESTER: Century House, St. Peter's Square . . . . . Central 3101  
BIRMINGHAM: 90, Hagley Road, Edgbaston . . . . . Edgbaston 2466  
LEEDS: 70, Albion Street . . . . . Leeds 27174

BRISTOL: 8, Upper Berkeley Place, Clifton  
Annual subscription £4 10s. Od. post free. Single copies, Two shillings  
Registered at the G.P.O. as a newspaper Entered as second-class matter in U.S.A.

Vol. 96]

FRIDAY, APRIL 18, 1952

[No. 16

## CONTENTS

	PAGE
Editorial Notes . . . . .	421
Regulations for Railway Signalling . . . . .	423
Canadian National Railways . . . . .	423
Support for the French Railways . . . . .	424
Bursting a Crossing . . . . .	425
Fell Diesel-Mechanical Locomotive . . . . .	425
Letters to the Editor . . . . .	426
The Scrap Heap . . . . .	428
Overseas Railway Affairs . . . . .	429
High-Power Bending and Forging Machine . . . . .	431
Electric Traction Section . . . . .	432
Japanese Railway Progress . . . . .	436
Pre-stressed Concrete Piling at Tyne Dock . . . . .	438
Personal . . . . .	439
Doncaster Accident Report . . . . .	441
Contracts & Tenders . . . . .	445
Notes and News . . . . .	446

## Passenger Fares

GOVERNMENT intervention in the application of the Passenger Charges Scheme, 1952, to British Railways outside the London Area has complicated an already complex situation. A statement was to be made on Wednesday last by Lord Hurcomb, Chairman of the British Transport Commission, on the way in which the scheme as approved by the Transport Tribunal should be applied outside the London Area as from May 1. The scheme, of which details have been given in this journal, provides *inter alia* for an increase of about 20 per cent. in season ticket rates, for a reduction in third class fares from 2.44d. to 1.75d. a mile, and for ordinary return fares to be double the single, which would have the effect of slightly lowering the present monthly return fares. The application of the scheme to British Railways in the London Area and London Transport railway and road services from March 2, a principal effect of which has been an increase in season ticket rates, has aroused much criticism; in deference to this the Minister of Transport, Mr. J. S. Maclay, recently referred the application of the scheme in the London Area, notably in the matter of bus fare stages, to the Central Transport Consultative Committee. On Tuesday evening, the Ministry of Transport announced that Mr. Maclay had issued a direction to the B.T.C. not to increase, at least temporarily, the charges which the Commission was authorised under the scheme to increase outside the London

Area from May 1, and that he would ask the Central Transport Consultative Committee to consider the application of the increases. The situation as we close for press is that while the direction is in force—assuming that it continues after May 1—the Commission may not raise fares, despite mounting costs, and must lower ordinary railway fares—an amendment by the Transport Tribunal to the Charges Scheme which the B.T.C. never sought. The Railway Executive is responsible for the efficient operation of the railways, including their commercial success; but the Government, the Transport Tribunal, the B.T.C., and now the Central Transport Consultative Committee are concerned in the details of railway passenger charges. As the Tribunal had ample opportunity to hear and to assess objections to the fare increases proposed, it is hard to see what purpose is served by reference to the Consultative Committee.

## Fair Competition in Free Transport

ACKNOWLEDGMENT of the importance of early action on transport was given by Mr. Churchill in the House of Commons and to a Private Members' Committee on the eve of the Easter recess. To the meeting he said that the Government recognised the Transport and Steel Bills as being at least of equal importance and that no time would be lost in introducing both measures. Mr. Churchill's statement to the House on the same day was in reply to a question on the progress of the nationalised industries, and, with respect to transport, particularised the denationalisation of road haulage at the earliest possible moment as being the Government's intention. It is expected, however, that the forthcoming Transport Bill will be much wider in scope than the measure to denationalise road transport forecast in the King's Speech, and a considerable revision of the present administrative organisation of the railways is expected. It will be of equal importance to ensure that the Bill does not at the same time leave the railways bound by the restrictions on free and fair competition for traffic which have hampered them for so long and favoured their rivals.

## Colonial Railways Standards Conference

THE Colonial Railways Standards Conference held in London recently, under the auspices of the Colonial Office and the Crown Agents for the Colonies, ended its deliberations on April 9. The Conference, the scope of which was summarised in our March 21 issue, was of considerable value, in that a large measure of agreement was reached on the subjects discussed, which included the standardisation of loading gauges, overall dimensions of locomotives, carriages and wagons, as well as the coupler heights, vacuum brake equipment and similar details. The development of diesel traction was also dealt with. Consideration was given to the unification of gauges in Africa, which would appear to be a question of economics, rather than physical difficulty; it has been the practice for several years to design locomotives and rolling stock capable of conversion to the 3 ft. 6 in. gauge with the minimum of alteration. In closing the Conference, the Minister of State for Colonial Affairs, Mr. Allan Lennox-Boyd, M.P., congratulated the members on the spirit of co-operation which had prevailed. The recommendations of the Conference will be embodied in a report, to be published in due course. It is proposed to hold a further Conference in September-October next year.

## Improved Flow of Traffic

SOME details published in the April issue of the *British Railways Magazine* show that the satisfactory movement of freight traffic achieved last winter is being maintained. Last month South Wales had only the normal number of some 2,000 loaded wagons on hand for destinations in England, whereas at one time in March last year there were 12,000 wagons waiting transit. Steel awaiting transport at the end of last month had actually fallen to the sub-normal figure of about 5,000 tons, in contrast with 60,000 tons on March 31, 1951. Since

February there has been a surplus of coal wagons in all Regions after meeting the collieries' needs, and this reached the figure of nearly 20,000 surplus empty mineral wagons on February 22, whereas on the same date in 1951 there was a shortage of nearly 15,000 wagons. Drawing attention to the smaller number of locomotives and wagons available for traffic compared with 1948, of which Mr. John Elliot gave details in a speech reported in our March 21 issue, the article records that the number of wagons at the railways' disposal during part of the past year was actually 20,000 higher than twelve months previously, largely because of strenuous efforts by the repairers.

### An Inopportune Claim

**T**O couple a wage claim in these days with a demand for a shorter working week suggests at best a failure to appreciate the economic position of the country. On a less lenient view it would reflect indifference to the true interests of those on whose behalf the claim is put forward. It is expected, however, that an application for hours of work to be reduced from 44 a week to 40 will follow a claim for a substantial increase in wages now being considered by the Confederation of Shipbuilding & Engineering Unions, which will affect some three million engineering and shipbuilding workers. Such a claim would be inappropriately timed when the need is for greater productivity in existing hours. Indeed, the importance to the national economy of longer working hours was acknowledged by the Budget provisions for reducing the rates of income tax on overtime for many workers. This measure was in the best interests of those concerned, for higher wages unaccompanied by a greater output of goods are an illusory benefit to the individual and a further step to inflation. There have been criticisms that members of the present Government are not being forceful enough in presenting the facts of the situation to the public, and there may be evidence in the results of the recent county elections that the country still dreams of easy solutions to present difficulties.

### Overseas Railway Traffics

**T**HE advance in Canadian Pacific Railway working expenses was again greater than the accompanying improvement in gross earnings, during February, so that net earnings for the month fell by £117,000 to £458,000. Working expenses were £1,574,000 higher at £11,317,000 and gross earnings were £11,775,000, as compared with £10,318,000 for the equivalent period of 1951. On the aggregate net receipts for the current nine weeks are down by £546,000 at £498,000, the result for January having been a £429,000 deterioration to £40,000. South African Railways financial year 1951-52 ended on March 31 and receipts should be well above those for the preceding twelve months. At March 15 aggregate traffics for the 50 weeks to date were higher by £9,419,382 at £95,719,727, and should receipts have continued to improve at the same rate as in recent weeks the result for the year will show an advance by over £9,500,000. During the week ended March 15 there was a £158,852 increase to £1,991,877 in S.A.R. receipts.

### Locomotive Engineers Summer Meeting

**A** VERY successful summer meeting of the Institution of Locomotive Engineers was held on April 8, when some 200 members and guests were conveyed to Rugby by special train, and were taken on a conducted tour of the turbine and diesel engine manufacturing shops of the English Electric Co. Ltd. A feature of the visit was the inspection of a prototype experimental coal-burning gas turbine intended as a prime mover for a 2,700-h.p. locomotive. The turbine is shortly to be erected, after which a series of tests will be conducted in the works. The departments visited included the foundry, heavy and light machine shops and turbine and diesel erecting shops, together with the engine-testing departments. A buffet tea was provided during which the members were joined by Mr. E. M. Price, Manager of the

company's Rugby works. The President, Mr. Julian S. Tritton, in expressing the thanks of the members for a very enjoyable visit, referred to the different ranges of products they had inspected. He considered that such visits were of considerable value to members since they had the opportunity of seeing something of the production methods employed. Mr. E. M. Price replied suitably to the speech.

### The C.N.R.—A Diesel Pioneer

**T**HE Canadian National Railways pioneered the diesel locomotive in North America by introducing in 1928 a two-unit, 2,660-h.p. machine which was then the largest diesel in the world. This achievement, said Mr. E. J. Feasey, general supervisor of diesel equipment for the C.N.R., in a recent address, was one of which the company was proud, but the diesel experiments made in Europe before the building of North America's first diesel, should be acknowledged, for they supplied valuable data in the field of transmissions which led to the general adoption of the present electrical type. The present-day diesel was based on the experiments of a few men carried out over a relatively short period of experience. When the number of men now engaged in diesel work and the resources at their disposal were considered, it was safe to predict a marked advance in developing higher engine power and achieving greater operating economy.

### Extension of C.N.R. Diesel Traction

**A**T the end of last year, the C.N.R. had 280 diesel locomotives of all types in service, and some 17 per cent. of all its through freight traffic was diesel-hauled. Approval has been given in principle to a five-year plan for partial dieselisation directed towards freight, passenger, and yard services where fairly intensive user of locomotives can be obtained and advantage taken of the greater availability and lower operating costs of diesel power. This project, involving large capital expenditure, can be justified by the substantial economies made possible not only in train operation but also by the rearrangement of servicing and repair facilities. The company expects a "modest increase" to its diesel fleet this year, but substantial additions must await the provision of more servicing facilities. Training of staff who will operate and maintain diesel locomotives is now taking place.

### Neutralising Transformer Effect in a.c. Motors

**O**NE of the many Swiss contributions to the development of the single-phase locomotive was the use of resistive shunts across the interpoles, to neutralise voltages induced in the armature windings by the pulsating main field flux. This solution can be fully effective only at one speed, but it is adequate when that speed is reached quickly and most of the running is close to it. In heavy freight service, however, acceleration may be slow, and more time may be spent at speeds outside the zone in which useful compensation is provided by the shunts. Such conditions can be met by having a range of shunts of different values. This method has been adopted in the latest single-phase freight locomotives built by the General Electric Company for the Pennsylvania, which are described on another page. It is used in conjunction with an automatic relay system for switching in the appropriate shunt values for different speeds, the three values available covering the ranges 0 to 26, 26 to 40 and above 40 m.p.h.

### Welded Boilers

**T**HE great progress made in the construction of welded boilers on the Continent within the last ten years has overshadowed activity in the U.S.A., where all-welded boilers first began, on the Delaware & Hudson, in 1937. The cause at first sight is simply the progress of the diesel in the United States to the virtual exclusion of the steam locomotive for new construction. The first factor in point of time, however, was the extraordinary caution of the

Interstate Commerce Commission, which by its rules not only prevented further welded boilers being built for several years, but also made the welded boiler almost prohibitive in cost by insisting, among other things, that the complete shell should be annealed as a whole. Only Alco put down an annealing furnace of the size needed, and it can hardly have been a paying proposition. Even now, only 23 all-welded boilers are to be found in the United States, and there are another 12 on the Canadian Pacific. In recent years, all-welded steel shells have been used for replacement boilers on large locomotives, and there are, of the 92 in service, 57 on the New York Central. In Europe there are hundreds, if not thousands, of all-welded boilers in locomotive service, most of them with all-welded non-screwed firebox and boiler stays. They have been built by at least five works in Germany, one in Czechoslovakia, and one in Austria, and Hungarian works are now fabricating them even in such small sizes as boilers with only 400 sq. ft. of heating surface and a barrel length of 100 in. In none of them is the boiler annealed after welding up.

### Regulations for Railway Signalling

FOR more than a century railway working in Great Britain has been subject to codes of requirements that have contributed much to present standards of safety and the development of sound signalling practice. Their evolution through the years was described by Mr. T. S. Lascelles, President of the Institution of Railway Signal Engineers, in his presidential address to the institution on April 2. The first steps were taken by Acts passed in 1840 and 1842, with officers appointed to the Board of Trade with powers to inspect any railway at any time and the duty of examining all new lines before they were opened for traffic and certifying that it was safe to do so. This legislation was very broadly drafted and eventually, when difficulties were experienced in knowing what would be demanded before a line was permitted to be opened, the Board issued in 1858 the first printed list of requirements, which were very modest in scope, but contained certain fundamental items. These requirements have been through 19 editions, the last appearing in 1950.

Experience in administering the early Acts led to the passing of a much more comprehensive one in 1871, which brought certain classes of alterations and extensions to existing railways under the powers of the Board. This Act continues to form the basis of present procedure. It legalised accident enquiries and prescribed certain procedure. Anxiety over the number of accidents led to the appointment in 1874 of a Royal Commission. It conducted trials with various continuous brakes near Newark in the following year and reported early in 1877, but no legislation calling for the application of any particular devices or methods of working resulted. While the Commission was sitting, however, a very bad single line collision took place near Norwich and then a serious derailment near Oxford, which had a marked effect on the Board's attitude to future requirements, a new issue of which was sent out accompanied by an intimation that certain things would thenceforward be insisted on, which it was hoped railway directors would apply also to lines already at work. Twelve years later an excursion train running away on an incline in Ireland, attended by 80 fatalities, brought matters to a head and caused Parliament in 1889 to impose block working, interlocking and automatic continuous brakes on passenger trains, and gave the Board power to call for these safeguards on existing lines within a time limit.

By the beginning of the 90's there were signs that signalling was entering on a new phase in which the influence of developments that had taken place chiefly, though not by any means entirely, in America, was becoming noticeable. By the turn of the century automatic and power signalling found appreciable application on British lines. The Board's officers had adopted a progressive outlook in this and related matters, although not for some years did the printed requirements contain reference to automatic signalling. By

the time the 1914 war broke out, it had been recognised that the requirements called for further and thorough revision, but the work had to be put in abeyance. The delay in extending the latest practice, caused by the war, was not without its advantages and influence on the course of signalling practice in Great Britain, for progress in the construction of light signals made the adoption of the multiple-aspect principle much easier to carry through and the Committee of the Institution of Railway Signal Engineers appointed in 1922 recommended that such signalling should always be carried out with their aid. In 1925, revised requirements appeared, arrived at by direct consultation with railway officers appointed by the Clearing House. They were issued by the Ministry of Transport, to which the Board's powers in these matters had passed in 1919, and were welcomed generally as a most important step forward. It became necessary, however, to re-issue them three years later, when it was definitely stipulated that multiple-aspect signals were to be of the light type.

In the interval between the wars, the thoughts of signal engineers were turning in the direction of a greater use of electrical controls, the abolition of mechanical locking in power frames and finally the application of relay, or circuit, interlocking with free operating handles, while the junction indicator appeared, to simplify the operation of many layouts. The provisional sanction given to these changes finally necessitated a further revision of the requirements, but once more war intervened and only in 1950 could the new edition be made available. In this, everything of proved worth in the best British practice in signalling—as in other aspects of railway engineering and operation—was incorporated, with the customary opening for the introduction of any new advance that has always distinguished official action in this matter in the United Kingdom.

### Canadian National Railways

THE operating revenue of the Canadian National Railways last year was \$624,834,120, a record, but operating expenses, at \$580,150,221, rose even more sharply, largely because of wage increases and rises in the cost of materials, and the net operating revenue dropped by more than \$15,000,000, to \$44,683,899. Higher wage rates increased the wage bill by \$33,900,000 to \$381,654,000. The annual report for 1951, signed by Mr. Donald Gordon, Chairman & President, says that the system has never failed to meet operating expenses, but except in 1926, 1928, and 1941-45 it has been unable to meet the heavy fixed interest charges with which it has been burdened since its inception. It expects, however, that the measure of relief recommended by the Royal Commission on Transportation will be made available in 1952.

Freight traffic was the heaviest in the company's history—nearly 90,000,000 tons. Revenue ton-miles increased by 13.9 per cent. over 1950, and revenues by 11.9 per cent. to \$498,800,344. In spite of rate increases awarded during the year, unit revenues for 1951 were 1.8 per cent. lower, on the average, than in 1950, the revenue per ton-mile having fallen to 1.369 cents, chiefly because of large increases in the volume of low-rated traffic. More than 17,000,000 passengers, an addition of some 500,000, were carried, as a result of increased immigration, tourist travel, and military movements. Passenger revenue, \$47,475,661, showed a 19 per cent. improvement. To handle its share of the 194,000 immigrants, the largest intake since 1913, the C.N.R. operated 286 special trains. The following table compares the principal results for 1951 and 1950:—

	1950	1951
Passenger train-miles	22,387,001	24,412,847
Goods train-miles	45,458,577	48,353,158
	\$	\$
Goods revenue	445,780,004	498,800,344
Passenger revenue	39,889,206	47,475,661
All other operating revenue	68,162,371	78,558,115
Total operating revenues	553,831,581	624,834,120
Operating expenses	493,997,079	580,150,221
Net operating revenue	59,834,502	44,683,899
Taxes, rents, etc.	17,417,730	12,900,780
Interest on public bonds	24,019,158	23,467,703
Government interest	21,658,849	23,347,412
Deficit	3,261,235	15,031,996



The 25-mile Quebec Railway, Light & Power Company line from Quebec City to St. Joachim, and the New London Northern Railroad Company's line, of 121 miles, formerly leased to the Central Vermont Railway, were acquired. Construction of the new 15-storey wing of the Macdonald Hotel in Edmonton and reconstruction of the Newfoundland Hotel, St. John's, made progress. The volume of traffic and intensive industrial development resulting from expansion of the Canadian economy have caused serious congestion in many terminal and yard facilities, and systematic study is being carried on to improve facilities and operating methods. A modern hump marshalling yard in the Cote de Liesse area of Montreal has been planned to relieve congestion at Turcot yard, which not only serves a heavy concentration of industry but is also the focal point for through freight traffic to and from the Maritime Provinces and the United States. Because of its restricted site it cannot be expanded sufficiently, and eventually will become a storage and supporting yard.

It is expected that an intricate track rearrangement at Montreal Central Station will be completed in 1952. By the end of 1951, a four-storey office building, an extension to the inwards shed, and the shed office building at the Bonaventure freight terminal were nearing completion. A new paint shop at Point St. Charles was 70 per cent. completed and track alterations were made in preparation for a new diesel shop extension. The enlargement of Mimico Yards, Toronto, and rearrangement of tracks was almost completed.

Approval in principle has been given to five-year programme of partial dieselisation. A training scheme for staff who will operate and maintain diesel locomotives has been operating for some months. During the year, 103 new diesel locomotive units were delivered, bringing the total to 280, with 62 orders still outstanding for equipment in this category. Developments in other types of motive power, such as the diesel mechanical-drive locomotive, are being carefully observed. Further study was made of the possibilities of diesel railcars on short journeys where traffic is relatively light.

More than 5,000 box cars were received and 1,274 old box cars were withdrawn. Deliveries are expected this year and next on outstanding orders for 9,635 freight vehicles. The steel shortage and defence requirements are likely to defer until at least 1953 the delivery of new passenger stock; none was added in 1951. Shortage of materials, slow deliveries, and the need to recruit and train additional workers because of the shorter working week have delayed the programme of maintenance of permanent way and structures.

Centralised traffic control was introduced on 148 miles of main line between Foleyet and Hornepayne, Northern Ontario. A similar installation on an important subdivision in Michigan was 70 per cent. completed. Automatic block signals were installed between Jasper and Red Pass, 43 miles; eventually this signalling will be extended to Port Mann, British Columbia, which is 512 miles from Jasper.

Compared with 1928, the peak traffic year between the wars, the C.N.R. in 1951 supplied 58 per cent. more freight transport with 12 per cent. fewer locomotives and 12.4 per cent. fewer wagons. At the same time, the average speed was 23 per cent. higher. Locomotive and wagon mileage has increased, trains and average wagon loads are heavier and fuel consumption has declined. Tests of lightweight materials for freight stock are being made. Other projects include an investigation of the problems of mechanical refrigeration, the development of a new type of air-conditioning, lighting and heating equipment for coaches, and experiments in a better use of coal in steam locomotives.

The strategic position of the C.N.R. in relation to the economic frontier has been shown by significant developments in northern Manitoba and north-western British Columbia. Reference is made to the new Sherridon-Lynn Lake branch under construction, and to the projected branch from Kitimat, British Columbia, centre of a new aluminium industry, to the Prince Rupert line. In general, the policy of the management is to use road transport

as an adjunct to basic rail services "Wholesale and indiscriminate" operation of buses and lorries is not contemplated. Eight small-scale lorry services and two bus services, between Prince Rupert and Smithers, in British Columbia, and between United States points and Sydney and Halifax, operated jointly with the Maine Central Railroad, were inaugurated. Among other projects is a plan for bus and lorry services co-ordinated with railway operations in Prince Edward Island.

### Support for the French Railways

**T**WO publications, both defending the record of the French National Railways in 1951, have recently appeared. One is a preliminary review of the year's activities by Monsieur Louis Armand, Director General of the S.N.C.F., the other a booklet issued by the Association pour la Défense du Chemin de Fer (Railways Protection Association), which is akin to the Railway Students' Association in Britain. Although the Association is an independent body, the S.N.C.F. is most interested in its activities and gives considerable support; many, though not all, of its members are S.N.C.F. employees.

Monsieur Armand's report is replete with statistical tables of commercial and operating results; the Association's report is more "popular," showing the highlights of the year in pictorial form. Both tell of record traffics handled with a reduced staff, and of high operating efficiency, but also of an increased deficit claimed to result from circumstances outside the control of the S.N.C.F.

During 1951, some 28,000 million passenger-km. were handled by the S.N.C.F., 6.8 per cent. more than in 1950, and equal to the pre-war record result of 1929. Revenue freight traffic reached a new peak of 45,400 million tonne-km., nearly 17 per cent. above 1950 and 8.6 per cent. higher than in 1929. Staff decreased by 17,600 to 424,700; since 1947, the total staff has been reduced by 11 per cent., a result made possible mainly by the Paris-Lyons electrification and other modernisation works, and as a result of the Government's restrictions on capital works.

The S.N.C.F. defines traffic units as the sum of passenger-km. and net tonne-km. Both documents show that during 1951 the number of traffic units handled—73,600 million—was a record, surpassing the previous highest figure of approximately 70,000 million, reached in 1929 and again in 1948. The number of traffic units per man-hour in 1951 is estimated at 79.5; the previous best was 67.3 in 1950, and the 1929 figure was 60. The number of passenger-km. per passenger vehicle operated in 1951 was 1,517,000, and the tonne-km. per freight wagon was 109,500; both were records. By improvements in steam locomotive design, and the development of electrification using mainly hydro-electric power, Monsieur Armand states, the S.N.C.F. has made large savings in coal consumption. Since 1938, the average amount of coal consumed by steam locomotives per 1,000 gross tonne-km. has been reduced from 65 kg. (143 lb.) to 59 kg. (130 lb.); in 1950 the figure was 62.5 kg. (138 lb.).

The deficit nevertheless reached a new post-war peak of fr. 90,000 million (£90,000,000). The Association states that in 1951 permanent way maintenance and renewal cost the S.N.C.F. £76,000,000, but other forms of transport did not have this expense. This argument is reminiscent of the British railways "Square Deal" campaign before the 1939-45 war. Particular reference is made to the importance of secondary lines, and the dangers of indiscriminate closure. Such lines represent 41 per cent. of the total route-kilometrage of the S.N.C.F., but account for only 20 per cent. of the deficit. Their contributory traffic value to the main lines is put at some £50,000,000 a year.

An attempt is made to assess possible remedies to bring prosperity to the S.N.C.F. The 1951 statistics are claimed as evidence of operating efficiency, whilst the fact that the S.N.C.F. is responsible for 60 per cent. of the passenger and 72 per cent. of the freight movement in France indicates its economic importance and public appreciation.

The S.N.C.F. must be permitted to increase receipts by raising charges. Fares and freight rates in 1951 were, on



the average, only 14 and 15 times higher respectively than in 1938. Monsieur Armand estimates that if rates and fares had been 24 times their pre-war level, a surplus of £10,000,000 would have been earned; this makes no allowance for loss of traffic that such an increase might have caused. There should be more freedom to undertake new capital works. Both publications stress this point strongly, but although one must be impressed by the economic soundness of the argument, the problem is not confined to the S.N.C.F.

Monsieur Armand concludes by referring to the parliamentary discussions which have been taking place on possible changes in the structure of the S.N.C.F. He claims that any reforms must be on the lines of a complete reorganisation of land transport.

### Bursting a Crossing

**T**HE history of railway accidents includes numerous instances where, but for local circumstances, those travelling in the train which came to grief probably would have suffered little harm. In all accidents the casualties must be to some extent fortuitous, for a train may be lightly or well filled. In derailments other considerations usually enter into the picture. Casualties have sometimes been surprisingly light, in others remarkably heavy, the difference often resulting entirely from the position of the train when it left the track and the characteristics of the surrounding lines, station platforms, and other features.

The Sevenoaks derailment of August 24, 1927, might have resulted in nothing worse than a severe shaking for the passengers instead of 13 fatalities, had the train not been approaching an old bridge with a central pier, in which part of it became jammed. Somewhat similar circumstances attended the serious derailment at Doncaster on March 16, 1951, when 14 lives were lost because of the presence of a bridge. Against this pier the third coach was dragged by the pull from the engine and pushed by the force exerted by the following vehicles with such violence as to crush it to destruction, bending its steel underframe into a "U," the snatch fracturing a Buckeye coupling pin in double shear.

The Doncaster derailment naturally attracted great attention, not only because of the resultant casualties but also from the fact that the train had just started and was not travelling at any speed. It was inquired into by Lt.-Colonel G. R. S. Wilson and Brigadier C. A. Langley. Their report, summarised in this issue, is of necessity of some length and needs to be studied in the original if it is desired to know every detail of the case. The main conclusions and evidence on which they are based can be more shortly stated. The train was passing through a scissors crossover, up slow to up main, where superelevation had to be such that the run-up of the cant was very steep—in certain circumstances a disagreeable necessity. Of recent years a speed limit of 10 m.p.h. has been in force over the slow line approach from the station and through this connection, but unfortunately, as in so many places, it has been indifferently observed. Even after the emphasis on its necessity created by this grave accident, trains were seen, by the inspecting officers themselves, traversing the crossover at quite double the permitted rate. This is, regrettably, no new experience. The conclusion, supported by practical tests, was that the train concerned passed at from 20 to 25 m.p.h. There was no reason for supposing that the condition of either locomotive or train contributed to the accident and the cause of the initial derailment had to be sought elsewhere.

Some interesting trials were made over a similar piece of track with two loaded vehicle frames. By derailing certain wheels, moving the frames to and fro and comparing their behaviour with rail marks, reproducing those produced by the accident, very helpful results were obtained, which pointed to excessive speed not being a major contributory factor, although it could not be left out of account. Attention was turned therefore to the

possible failure of the crossing. The report lists in detail 12 derailments of passenger trains at "V" crossings inquired into in the present century and one not formally so dealt with. Of these perhaps the best remembered was that at Witham, Great Eastern Railway, on September 1, 1905, when the Cromer express left the rails, travelling at some 50 m.p.h., with highly destructive results and the loss of 11 lives. The inquiry was remarkable for the extraordinary contradictions in the evidence, and for having to be reopened a month later when a new witness came forward, whose statements also were strongly disputed.

Two of these accidents had much in common with that at Doncaster, and it was concluded, from a review of all those cases and every relevant fact revealed by the inquiry, that the disaster was initiated by the bursting of the crossing. All crossings form inherently weak points in the track and their components are subject to constant shock. It is considered desirable, therefore, to investigate the behaviour of the bolts used with them and whether some reinforcement can be given to the throat bolt where conditions are severe, possibly by adding steel yokes embracing the rails. Flat-bottom type crossings are in any case much stronger than the earlier bullhead designs. At the request of Colonel Wilson and Brigadier Langley, a scheme has been prepared for rearranging the Doncaster layout to allow of speeds up to 20 m.p.h. They point out that few locomotives in Great Britain now have speed indicators, aids to driving which would be welcomed by civil engineering and footplate staffs alike, and recommend that they be applied to all new standard type engines and to any existing engines intended to run in important passenger services.

### Fell Diesel-Mechanical Locomotive

**T**HE British Railways Fell diesel-mechanical locomotive, described and illustrated in our June 1, 1951, issue, formed the subject of a paper delivered before the Institution of Locomotive Engineers by Lt.-Colonel L. F. R. Fell on April 16. Colonel Fell said that the main advantage of the Fell diesel mechanical system is that it makes possible a diesel-driven locomotive which can deliver a drawbar horsepower per ton weight of locomotive which not only equals but exceeds that of a steam locomotive. On a run between Manchester and Derby, a speed of 48 m.p.h. was obtained up 1 in 100, with twelve carriages, equivalent to about 1,440 d.b.h.p. In the reverse direction up 1 in 90 with the same load a speed of 44 m.p.h. was attained, equivalent to about 1,400 d.b.h.p.

As the weight of the Fell locomotive is 118½ tons, the performance was equal to twelve d.b.h.p. per ton weight of locomotive in working order. A better figure was achieved on a run between London and Derby when 45 m.p.h. was maintained for three minutes up a gradient of 1 in 120 with a trailing load of 450 tons. Colonel Fell said the high power/weight ratio of the Fell locomotive was due to (a) the use of a multiplicity of small engines, by which means a higher piston area per unit weight is obtainable; (b) the weight of transmission parts per b.h.p. is low compared with other systems; (c) high transmission efficiency; only about 5 per cent. is lost in the gearbox.

No special cooling arrangements had been found necessary for any part of the transmission; under particularly arduous conditions the maximum gearbox temperature recorded was 175° F. The multiple engine arrangement had the additional advantage of increasing reliability. Colonel Fell said that on one run from Derby to London with twelve carriages, express schedule was maintained with only three engines in operation. Locomotive 10100 was the only locomotive operating with the Fell diesel mechanical system, and was the only unit about which established facts could be quoted. The author said that a transmission system which permits the designs of locomotives with two main engines only was under consideration, and it is thought that this arrangement has considerable possibilities particularly in the medium power range for which the largest demand for diesel locomotives exists.

## LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

### Honours for Royal Funeral Party

April 7

SIR,—I see the Queen has honoured the officers and men who drew the gun carriage at His Majesty's funeral. I have not seen any such award to those on the railways who had an even greater responsibility!

Yours faithfully,

(MISS) GLADYS CRANE

Leinster Court Hotel, London, W.2

handling, whereas in the case of mineral traffic the cost of station (i.e., private sidings) and handling, is borne by the trader and not included in the receipts per wagon mile.

Heavily loaded mineral traffic in rafts of wagons or train loads is a profitable traffic and makes a valuable contribution to railway net revenue.

Yours faithfully,

M. F. BARNARD

Steel House, Tothill Street, London, S.W.1

### Nord Baltic Locomotives

March 24

SIR,—On page 282 of your March 14 issue mention is made of the two 4-6-4 type locomotives put into service on the Nord in 1911.

These locomotives were designed by Monsieur du Bousquet with the object of hauling 400-ton trains at 75 m.p.h. on level track. They had the characteristics of this eminent engineer's products. The steam passages on the l.p. side in particular were proportionately 10 per cent. larger than those of the celebrated Atlantics.

Unfortunately, Monsieur du Bousquet died two months before their completion, and his successors dealt only half-heartedly with the unavoidable teething troubles of an entirely new design. In view of coming events, renewing the Nord freight locomotive stock was the main problem at the time.

Tests showed that the Baltic locomotives were capable of developing 2,800 i.h.p. and of hauling 800 tons at 78 m.p.h. on the level. On one occasion a load of 1,200 tons was accelerated to 68 m.p.h. down the 1 in 140 gradient past Neufchatel, and hauled at that speed for several miles averaging 1 in 1,000 down to the outskirts of Boulogne.

At the time the Baltics were the most powerful passenger locomotives in the world, not excepting America, and greatly in excess of requirements, which, at a period when efficient mechanical stokers were not available, explains that they were not multiplied.

Yours sincerely,

VUILLET

58, Rue de Courcelles, Paris, 8

### Movement of Mineral Traffic

April 8

SIR,—I observed that Mr. R. Bell in his letter in your March 28 issue refers to the fact that minerals produce the lowest revenue per ton and per ton-mile. I should have thought Mr. Bell had a sufficiently long memory to recollect from his personal experience how profitable mineral traffic was on the former North Eastern Railway. In any case, I think he is out of harmony with present-day opinion in basing the profitability of traffic on the "per ton-mile" receipts. The wagon mile is a much more reliable basis and it may be news to him that iron ore, perhaps the largest mineral traffic, now mainly travels in wagon loads of 20 to 27 tons.

The average wagon load figures are no longer available for iron ore, but taking the receipts per wagon mile from the B.T.C. Annual Report, 1950 (pages 65 and 413), the following is the position:—

		Average wagon load (tons)		Receipts per ton-mile (d.)		Receipts per wagon mile (d.)
Merchandise	...	3.73	at	3.06	=	11.41
Minerals	...	10.73	at	1.55	=	16.63
Coal and coke	...	10.66	at	1.83	=	19.50

It should be noted that the receipts per wagon mile in the case of merchandise traffic have to cover the cost of providing costly terminals (including tranship sheds) and

### Merits of Gas Turbine Traction

April 3

SIR,—I think you have done so far rather less than justice to the implications of the Metrovick gas turbine. First of all, it is in a class by itself as regards power. It could restore the pre-war 4 hr. London-Plymouth time, compared with the present 4½ hr., though that could be done with the existing engines if desired, and it could do this with much heavier trains, or, alternatively, the time could be cut to 3½ or even 3¼ hr.

The wider implications are much more important. Diesels run on costly imported fuel, and it is difficult to see how they can ever be justified for main line express passenger traffic. Gas turbines, on the other hand, are being developed to work on home-produced pulverised fuel. Now one is working on peat in John Brown & Co. Ltd. shipyard, Clydebank, at the instigation of the North of Scotland Hydro-Electric Board. There is no lack of peat in Britain and nobody has found any other use for it.

This new method of propulsion at one sweep has made it possible to have an express engine 50 per cent. more powerful than any in service and which, unlike the diesels, is not dependent on imported fuel.

Yours faithfully,

JOHN SLEIGH

29, Ashfield Road, Andover

### Need for Change on the Railways

March 31

SIR,—Mr. Cecil J. Allen's letter in your March 28 issue deserves the strongest support from the long-suffering public. A fresh start, a clean sweep, and some flexibility of ideas are needed desperately in the Railway Executive and the British Transport Commission.

Anyone who is in possession of *Bradshaw* for, say, July, 1939, should turn to the main-line tables for the G.N.S.R. section and compare them with those of last summer. Twelve years ago the timetable sparkled with life and the excitement of new ideas to win more traffic; men with imagination and youth and the spirit of competition made it, and it was alive. Today, the timetables are soulless, drab, moribund, and pointless. No wonder they win no traffic from the roads! As to the branch lines, the Commission and the Executive say "close them down," oblivious of the fact that in other countries new and cheaper forms of railway transport are being tried.

No wonder that at last almost the whole of the non-technical press—as shown by the first editorial note in the same issue—is eager for a change at the top, and that many men of all shades of political opinion agree that there must be great changes, as is shown by the Parliamentary Notes on page 361 of that issue.

Hundreds, if not thousands, of all grades of staff of the railways feel that things are wrong, and many of the best of them are leaving before the ship begins to sink. Even the Railway Executive Chairman cannot persuade those whom he leads that all is well and that everyone has done and is doing a magnificent job of work since nationalisation.

Lastly, may I give my support to Mr. Newton Brooke's

thoughtful letter in that issue, and conclude by hoping that all your readers will have read and noted the second item on the Scrap Heap page.

Yours faithfully,

MICHAEL PETO

Dundonnell House, By Garve, Ross-shire

### The "Sud Express"

March 29

SIR,—I read with interest the article comparing European passenger services in 1913 and 1951, in your issue of February 29. Having travelled often by the "Sud Express," last in 1950, from Lisbon to Paris and back, I have found creditable timings both in Portugal and Spain, especially in view of the effects of the civil war in Spain.

In 1950, the "Sud Express" was allowed 7 hr. 18 min. from Lisbon to Vilar Formoso (Portuguese frontier station) against 8 hr. 26 min. in 1913, with steep gradients and curves, largely single line, and with frequent slacks over bridges not built for heavy loads and high speed. The timing from the Spanish frontier station, Fuentes de Oñoro, and Irun was in 1950 of 13 hr. 50 min., against 13 hr. 39 min. in 1913. The Madrid portion of the "Sud Express" was allowed 12 hr. in 1950 from Madrid to San Sebastian, compared with 13 hr. 24 min. in 1913.

The "Sud Express" is much heavier than in 1913, when it was composed exclusively of Wagons-Lits Company cars with wooden bodies. The Lisbon portion is made up of two sleeping-cars, one Portuguese Railways first class coach and a Wagons-Lits brake van from Lisbon to Irun,

with a restaurant car from Lisbon to Medina del Campo, totalling some 250 tonnes. The Madrid portion is usually made up of three sleepers from Madrid to Irun, another sleeper from Madrid to Bilbao, two Spanish National Railways first class coaches (*coches butacas*) and a Wagons-Lits van from Madrid to Irun, with a restaurant car from Madrid to Medina del Campo. The approximate weight is 400 tonnes. The Lisbon and Madrid portions, less the restaurant cars, are worked together between Medina del Campo and Irun and Hendaye.

On my last journey the Lisbon portion was worked by a Henschel Pacific as far as Pampilhosa where another Pacific of the former Beira Alta Railway took over. From Fuentes de Oñoro to Salamanca the train was in charge of two venerable Spanish 0-6-0s. For the rest of the journey R.E.N.F.E. Mountains were used, except on the electrified section between Alsasua and Irun, where 2-C-C-2 locomotives haul the train.

The sleeping cars from Lisbon were of the usual broad-gauge type, built in England in 1927, but those of the Madrid portion were built to the standard Continental loading gauge, having been transferred to the Spanish railways to compensate for the lack of Wagons-Lits rolling stock because of losses in the civil war; they were fitted with broad-gauge bogies that looked disproportionate under the narrower coach bodies.

Yours faithfully,

R. BISAGNO

Casilla de Correo 563, Montevideo

[The timings of the "Sud Express" in Spain and Portugal in the current timetable are almost the same as in 1950.—Ed., R.G.]

### Publications Received

**P.L.A. Railways.** By Thos. B. Peacock. London: The Locomotive Publishing Co. Ltd., 88, Horseferry Road, S.W.1. 9 in. x 5½ in. 117 pp. Illustrated. Price 15s.—Normally between 600 and 700 vessels enter and leave the Port of London every week and the P.L.A., with a dock estate covering over 2,000 acres, operates an extensive railway system along its quays and as far as exchange points with British Railways. In this account of the P.L.A. railway system the author deals with activities of the former dock companies before they were vested in the P.L.A. in 1909, as well as more recent developments, and notes that as it did not come within the scope of the Transport Act, 1947, the system is independently worked. The "Royal," Millwall, and Tilbury dock railways are described and there are chapters on locomotives, train working, and administration.

**El Problema Ferrocarrilero de Mexico** (The Mexican Railway Problem). By Vicente Fuentes Diaz. Mexico. 9 in. x 7½ in. 186 pp. Paper covers. Published by the author. No price stated.—This is an excellently written and concise account of the history of railway construction and development in Mexico and of the political events which have had a considerable influence on the picture. The importance of railway communication in a country so extensive and so dependent on good connections with its neighbours was early recognised, but nothing very

effective was done until about 1870, although a short section of route was completed some 20 years before. Many concessions were granted that came to nothing, but gradually lines were built and slowly extended, so that several important routes, such as Vera Cruz to Mexico and the Tehuantepec system of lines, were completed. The author traces the whole story down to the present day and details the numerous financial and other crises which have had such a profound influence on the economic life of Mexico. The chapters on nationalisation are of considerable interest, and also that dealing with the changes and far-reaching improvements effected under the Alemán Government, which include the task of converting the Interoceanic and Mexico-Acámbaro lines—some 430 miles odd—from narrow to 4-ft. 8½-in. gauge.

**Non-Draining Cables.**—A new publication issued by British Insulated Callender's Cables Limited describes the construction and characteristics of a range of mass-impregnated non-draining cables. This type of cable has been introduced to overcome difficulties associated with the use of mass oil-resin impregnated paper-insulated cables on installations involving vertical runs and steep gradients. The new cable is impregnated with a special compound, the use of which is covered by a patent. A characteristic of the compound is that it is sufficiently fluid for penetration of the insulation at the impregnating temperature, but at the maximum working temperature will not

flow along the cable. Even at low temperatures it will not set too hard to prevent relative movement of the turns of paper when the cable is bent, and the bending radii of these cables are the same as for normal types, which facilitates installation.

**Iron & Steel Research.**—The April issue of the Bisra Survey published by the British Iron & Steel Research Association includes a short note on the operation of works railway traffic. Engineers of the Association have studied traffic movement within six steel works, and have compiled charts showing how the locomotives divide their time between their various duties. It is considered that much can be done to promote efficiency by providing rapid means of communication between traffic staff and locomotive drivers, and for this purpose very high-frequency radio is suggested as being the most promising medium.

**Travelling in Germany.**—Published by the German Central Tourist Association and obtainable from the German Tourist Information Bureau, 6, Vigo Street, London, W.1, and principal travel agencies.—Much valuable travel information is contained in this small brochure. Railway passenger facilities, including fare concessions and the various types of sleeping accommodation, are described. The foreign currency regulations are explained clearly. Particulars also are given of river, lake, and coastal steamer services and many other aspects of travel.



## THE SCRAP HEAP

### A Great Western Diehard

I was foolish enough, not long ago, to speak of "British Railways" to a [former Great Western Railway] dining-car attendant who has served me for more years than I care to remember. He looked dumbfounded. "British Railways!" he cried. "No, Sir, Great Western, so long as I am here."—Howard Spring in "Country Life."

### Bristolisation

It has really happened at last. A word of eighteen letters has been created which does exactly the work of nine. To add to the aesthetic appeal of the achievement, the original nine letters are all there in their first order at the beginning of the new word. The credit goes to the Bristol district of British Road Services, which has decided to re-organise the direction of traffic from the city. It is therefore asking its customers to "co-operate with us in the directionalisation of your traffic." It is understood that unusual results are expected—perhaps even an end of all misdirectionalisation.—From "The Manchester Guardian."

### Iron Horse into Fiery Dragon

If the inventors of gunpowder 400 years ago had known how to use steam—and they might well have done so—the iron horse would have assumed a very different shape and style... what a superb fantasy our forefathers could have created out of what we call a boiler! Can you imagine it? They would have made it a dragon's body clad with scales, a huge turtle's shell; the chimney would have been a unicorn's horn belching smoke, or a long neck and fiery

throat. And they would have concealed the wheels with huge fins or vast drooping wings; the carriages, too, would have assumed a hundred fantastic forms, so that at night the townsfolk would have watched the passing of a prodigious gargoyle with spreading wings, or a dragon breathing fire, or an elephant panting and trumpeting with uplifted trunk, all tempestuous, fiery, awe-inspiring, dragging behind them a hundred other monsters like chained captives and flashing across the landscape with the speed, the sound, the very aspect of thunderbolts.—An extract from the writings of Victor Hugo quoted in a recent issue of "La Vie du Rail."

### The Noise and the People

Not only are there many more men and women than there used to be, but they have gone out of their way to devise methods of generating, disseminating, and amplifying noise in all its forms. . . . The bustle of our larger termini was not drowned by a nasal and disembodied voice uttering in an incomprehensible dialect information about the train now standing at Platform Faife.—From "The Times."

### Free Travel

A black and tan Manchester terrier recently boarded the 8.5 p.m. train for Southampton at Waterloo when no one was looking. It was found the next morning at Southampton Station, sitting up comfortably in one of the carriages and greeting the porters with a flashing smile, a friendly growl, and a tail-wag. As the traveller was "without visible means" the police asked Our Dumb Friends' League, Southampton Branch, to collect the dog, which as it happens had chosen the League's most up-to-date dog's and cat's home for a free holiday. During the past twelve months the branch has received a Scottie which travelled from Yelverton and changed trains at Exeter, and a cat which took a train from Portsmouth.

### B. & O.—125 Years

On February 28 the Baltimore & Ohio Railroad celebrated the 125th anniversary of the granting by the Maryland Legislature of its original charter. Originally intended to connect the Atlantic port of Baltimore with the Ohio River, the railway now serves 13 States and the District of Columbia with 6,200 route-miles of line and roughly 12,000 miles of track, in which over \$700,000,000 has been invested. In 1950 it handled over 27,500 million ton-miles of freight and nearly 704,000,000 passenger train-miles.

In celebration of the century-and-a-quarter of B. & O. history, the United States Post Office Department has authorised the printing of 110,000,000 commemorative three-cent stamps. It will be recalled that at the Baltimore & Ohio centenary celebrations of 1927,

the Great Western Railway 4-6-0 locomotive *King George V* was sent across the Atlantic to represent Great Britain at the "Fair of the Iron Horse" in Baltimore, and made trips over B. & O. main lines.

### Works Outing Hires Channel Ferry

At the Easter week-end 320 employees of the General Electric Co. Ltd. took part in one of the largest works' outings to the Continent ever organised in this country. By arrangement with the Belgian Railways & Marine, the *Princes Josephine Charlotte* (formerly the *Car Ferry*) was chartered for conveying the party and nine motorcoaches from Dover to Ostend, whence the journey was made by road from Ypres to Paris. During the stay in Paris there were organised trips to Versailles, and Fontainebleau. The party returned to Ostend via Cambrai. Transglobe Limited provided the road transport and booked the hotel accommodation. A B.B.C. recording van accompanied the party on the Continent and by arrangement with British Railways crossed the Channel on the normal Dover-Dunkirk Train Ferry.

### Any Old Iron?

("Scrap Heap" of March 7 reported that Mr. R. Varley had been appointed to co-ordinate a drive for scrap material on British Railways.)

If "if's" and "an's" were pots and pans,  
We should not now be pleading  
For odds and ends, the lawyers could  
Provide the scrap we're needing.

"Locks, bolts and bars," the old song said,  
"Will quickly fly asunder,"  
If we put Wolf Packs on the job  
To "rifle, rob and plunder."

A visit to the pantomime  
Should Mr. Varley gladden;  
He'd get some tips for salvage from  
A study of Aladdin.

Keep your ears open, now, my sons,  
For pins that may be dropping;  
Equip yourselves with magnets when  
You go out bucket-shopping.

Be vigilant when having one  
Down at the "Jib and Spanker."  
You never know, you may pick up  
A keelson or an anchor.

Watch out for eccentricity,  
The "Scrap Boss" will requite all  
Who keep an eye on loosened screws;  
What's that? Who mentioned Whitehall?

And, if, in spite of all these hints,  
There's not enough to pile on  
The "Scrap Heap," write to Tothill Street,  
Or grab the Dome and Skylon!

A. B.



"Poisonous coffee, darling?—Bring a charge of doping before the stewards"

(From the "Evening Standard")

# OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

## SOUTH AFRICA

### Coal Haulage

During December, 1951, 97,130 tons of coal were hauled by rail from the collieries to the ports of Durban and Lourenço Marques, compared with 78,238 tons during November of that year. Revenue from coal carrying continues to increase, and earnings for the week ended February 16, 1952, reached a new record figure of £214,156, compared with the previous record figure of £211,122 earned in the week ended January 13, 1951.

## CANADA

### Pacific Great Eastern Extension

The British Columbian budget for the fiscal year ending March 31, 1953, shows that \$2,500,000 is allocated for completing the Quesnel—Prince George extension of the Pacific Great Eastern Railway.

## UNITED STATES

### Full-Length Dome Cars

The "Astra-Dome," "Vista-Dome," and other similar cars now running on some lines are so popular that the possibility is now being canvassed of building domes of considerably greater seating capacity. The generous dimensions of the loading gauge allow double-deck construction; above the centre section is a roof section, the dome all of glass, from which passengers have an unrivalled view over the top of the train. The outer ends of each of these cars are arranged as lounges, with stairs up to the dome, and the space below the dome section, which still provides ample headroom, is put to various uses. The suggestion of domes running the full length of the cars, and with up to 76 seats, has come from the Vice-President of the Budd Company, which introduced dome cars, and the plan is practicable constructionally.

### Reduced Fare Experiment

A reduced fare plan introduced on the highly scenic Denver & Rio Grande Western Railroad, which runs westwards from Denver through the Rockies to Salt Lake City, over some of the greatest railway altitudes in the country, has proved most successful. Previously, this line issued week-end return tickets at one and one-third the standard fares, but available for a maximum of five days only. The facility has now been extended to a total of 25 days, with the outward journey beginning on a Friday, Saturday, Sunday, or Monday.

In November, 1951, the first month of the new facility, the revenue from local Rio Grande tickets (distinct from those issued through to

or from other railways) increased by 10.6 per cent. compared with the corresponding month on 1950; in December the increase was 15.5 per cent. The only train excluded from the new fares is the "Colorado Zephyr," whose complement is mainly passengers travelling through over considerable distances.

### Closing of Philadelphia Terminus

On April 27 the Pennsylvania Railroad is to close Broad Street main line terminus, Philadelphia, and remove the station and the embankment—known as the "Chinese Wall"—which carries the approach lines. In our November 9, 1934, issue we described the extensive remodelling of railways in the city on which the company was then engaged; they included the construction of a new main through station (30th Street) on the west bank of the Schuylkill, and a new approach, partly underground, to a new Broad Street suburban station. The layout was rearranged to enable New York-Washington and New York-Pittsburgh trains to serve Philadelphia (30th Street) without reversing.

Formerly, more than 450 trains a day ran into and out of Broad Street terminus; now only 90 remain and they will be accommodated at 30th Street or at Broad Street suburban station, which is to remain. The demolition of Broad Street terminus and approaches will free 22 acres of land for civic development, including a new boulevard across the river, directly linking 30th Street Station with the city centre. There is to be escalator and stairway connection at 30th Street with a station on an underground line of the Philadelphia Transportation Commission.

Broad Street Station was opened on December 5, 1881, and enlarged in 1890. The train shed has twice been destroyed by fire, in 1923 and again in 1943.

## PORTUGAL

### New Concession

The Government has granted a new, 50-year concession to the Portuguese Railways Company, terminating on December 31, 2000, and replacing existing concessions with their varying dates of expiry. It is redeemable by the Government after 25 years.

The company is to modernise the system, and may be granted State aid. It can undertake directly, or through subsidiaries, land, sea, or air services, either as feeders to or connections between existing services. Special methods of economically working branch lines may be established.

The costs of maintenance and renewal of permanent installations, rolling stock, and accessories, must be borne by the company. A sinking and renewal fund will be established for motive power, and rolling stock. The company is fully

exempt from taxes or contributions to the State, with the exception of the railway tax (7 per cent.) incorporated in the tariffs and lower than that in force with the previous concessions (12 per cent.).

The company also benefits to some extent from the exemption from import duty on fixed installations and rolling stock, although protection of domestic products is maintained. It undertakes to apply reduced rates for certain Government traffic.

## SWITZERLAND

### Bicycle Hire Service

The Federal Railways, in agreement with a private contractor, have organised a bicycle hire service at stations and halts. The bicycles are completely equipped but do not bear the name of the maker. They have a control number as well as the name of the dépôt station.

The contractor undertakes maintenance and repair, and pays taxes and duties which may be levied on bicycles. The bicycles are hired first of all to railway users. The charge is graded, from fr. 1½ for 1 hr. to fr. 4½ for 12 to 24 hr. The hirer may return the bicycle to a Federal Railways station different from the dépôt station.

## FRANCE

### Railcar Trials

Trials have been carried out in the South-Eastern Region with a standard 600-h.p. railcar on the Aix-les-Bains—Annemasse, La Roche—St. Gervais-les-Bains, Chambéry—Bourg-St. Maurice, and Chambéry—Saint-André-le-Gaz lines. The object was to check the adhesion of railcars at speeds considerably higher than those at present authorised.

Between Chambéry and Bourg-St. Maurice line, 66½ miles, times achieved, including 16 intermediate stops, were 1 hr. 38 min. on the outward journey and 1 hr. 35 min. on the return. The highest speed reached was 72 m.p.h. between Chambéry and Moutiers-Salins, and 56 m.p.h. between Moutiers-Salins and Bourg-St. Maurice. The present timings by railcar on this line are 2 hr. 19 min. from Chambéry—Bourg-St. Maurice, and 2 hr. 8 min. in the reverse direction. The first reduction in timings will take place in May.

### Pilgrim Trains

The number of religious shrines has made the conveyance of pilgrims an important traffic. As many pilgrims are invalids, special facilities are required for their transport. The S.N.C.F. has adapted a number of saloon coaches, withdrawn from the commercial service, as ambulance vehicles.

The prototype vehicle includes a large

room containing 32 *couchettes* on two levels along the sides of the coach, and eight beds along the centre of the coach. At one end of the coach is a toilet compartment, and at the other a kitchen; there is a door in the centre to facilitate the unloading of pilgrims.

A further nine vehicles are to be adapted. By minimising the space above each line of *couchettes*, and installing bunks above the beds in the centre of the coach, it will, if necessary, be possible to provide lying-down accommodation for up to sixty invalids.

#### Rail-Road Co-ordination at Mâcon

A noteworthy example of rail-road co-ordination will be the joint rail-road passenger station to be built at Mâcon. The station has been designed in the shape of a letter T. The horizontal section will be 460 ft. long and will handle railway traffic; the vertical section will be 164 ft. long and serve road traffic. Booking offices for road and rail will be sited together at the centre of the station, but it is hoped ultimately that one booking office will issue tickets for both rail and road services. The station is expected to cost £250,000.

#### Improved Packing

As on other railways, many claims arise on the S.N.C.F. because of the faulty packing of goods. In pursuance

of its policy to give traders every assistance in designing suitable packages for different types of goods, the S.N.C.F. recently arranged a meeting for the French manufacturers of packing materials. It was held in Paris at the S.N.C.F. General Laboratory for Packaging Experiments, and was attended by officials of the firms concerned and senior officers of the S.N.C.F. and by representatives of the Ministry of Agriculture, the Standards Association of France, and packing manufacturers' associations. Amongst the subjects which were discussed was the possible use of pallets for the transport of fruit and vegetables.

### HUNGARY

#### Progress of Budapest Underground

Plans for a new underground railway in Budapest were finally approved in 1950. The plan provides for a line 19 km. long, traversing the city from east to west. Work began in 1951, and about 1½ km. of tunnel had been built by the end of last year. The Hungarian engineers engaged on the work have spent six months in Russia studying, in particular, the engineering methods used in the construction of the Moscow Underground and for the earthworks of the great canal works in the Volga and Don Basins.

Some 3,000 workers are at present engaged on the construction of the line. About 1,000,000 cu. m. of earth must be removed, and some 85,000 tons of steel, 150,000 tons of cement, and 600,000 cu. m. of gravel will be required. The railway is to be completed by 1954 and is likely to cost about £60,000,000.

Following the example of the Moscow Underground, much emphasis is laid on the artistic decoration of the stations, and the Ministry of Education has invited 72 Hungarian painters and sculptors to prepare drawings.

### AUSTRIA

#### Opening of New Semmering Tunnel

The new single-track Semmering Tunnel, mentioned in our March 7 issue, was opened to traffic on March 1, having been completed in 27 months. It is 4,956 ft. long. The original tunnel, almost one hundred years old, has been closed for reconstruction and conversion into a single-track tunnel. When this work is completed it is hoped that the delays on the Semmering line between Vienna and Yugoslavia and Italy will be eliminated. The new tunnel was built jointly by Union-Baugesellschaft and Universale Hoch-und Tiefbau A.G.

### BELGIUM

#### Railway Museum Opened

On October 30 last a railway museum was opened in part of Brussels Nord Station. This is regarded as only a temporary home for the collection in view of the eventual demolition of the terminus after the opening of the Junction line through the city.

There are three principal rooms. The first contains a picture by J. A. Neuhuys, "Inauguration of First Train from Malines in 1835"; the locomotive, *Pays de Waes*, owned by the former narrow-gauge line from Antwerp to Ghent; a complete range of models of locomotives, rolling stock and so on, from 1835 to the present time; and diagrams and plans. The second room includes railway seals and stamps, and old documents; among the exhibits in the third room are objects and documents pertaining to the resistance movement of Belgian railwaymen during the war.

### NORWAY

#### Reduced Fare Holiday Tickets

To promote off-season tourist traffic, the State Railways have brought in reduced fare holiday tickets, following an agreement with the State Holiday Council. The validity of tickets is extended over the following periods: May 1 to June 10, and August 20 to September 30.

The reduction amounts to 50 per cent. on the return journey, and the length of the single journey must not be less than 150 km.; the return journey must be made within 10 days of the date of the outward journey.

#### Austrian Dual-Purpose Locomotive



Locomotive of the Montafon Valley Railway, Austria, electrified at 700 volts d.c. It is also equipped with petrol-electric generator set for operating the motors when working with lowered pantograph over a short section of the 15,000 volt a.c. Austrian Federal Railways into Bludenz

Photo]

[W. H. R. Godwin



## High-Power Bending and Forging Machine

*Bulldozer of 300 tons capacity for hot or cold shearing and forming*

THE horizontal reciprocating bulldozer is not new in principle, and for some years has rendered useful service in carrying out various hot and cold bending, forming, and shearing operations. In the design of such machines, however, considerable advance has been made, since weighty construction was regarded as an essential to machines of this type, by greater attention to mechanical details and the fitting of limit switches and push-button control, making for easier operation.

The bulldozer lends itself to a variety of work on locomotives, carriages and wagons, such as bending and setting of fall plates angle gussets, breather plates, and the cold shearing of irregular shapes, such as axlebox lids of steel plate, the material being first sheared to finished width in multiple lengths. The firm of Joshua Bigwood & Son Ltd. has recently designed and built a bulldozer in conformity with the following data:—

Capacity	...	...	300 tons end pressure
Speed	...	...	10 strokes per min.
Stroke	...	...	32 in.
Die space, with crosshead	...	...	
forward	...	...	48 in.
Crosshead face area	...	...	72 in. x 24 in.
Motor	...	...	30 h.p. at 940 r.p.m.

### Design Features

The main frame is of fabricated steel construction, fully stress relieved before machining, and designed to make the most economical use of material, at the same time providing that rigidity essential to machines of this kind. The back dieplate is open at the centre to accommodate dies for deep drawing for the bending of drawgear shackles and so on. When desired the frame can be fitted with a post instead of a back plate.

The sliding die head is a steel casting with tee slots for the attachment of dies. The sliding surfaces of the head are lined with hard bronze strips and are adjustable to take up wear. The bed of the machine over which the head travels has hardened and ground-steel facings attached to the frame. Spring-loaded felt wipers are fixed to the slider to prevent the collection of dirt on the bearing surfaces.

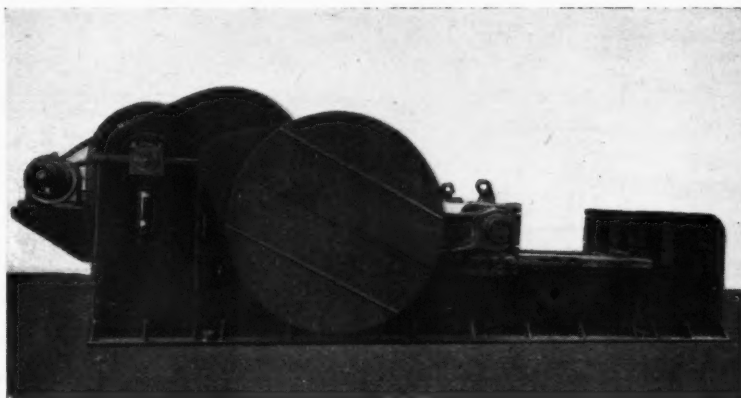
The drive is taken from a slip-ring

motor through vee-belts to a pulley attached to a balanced flywheel mounted on anti-friction bearings on the high-speed shaft, and is connected to it through a Taylor plate-clutch, the driven half of which carries a brake. The brake is permanently spring-loaded so that the ram is brought to rest immediately the clutch is released.

From this shaft the drive is taken through a pinion and gear to an inter-

anti-friction bearings are grease-packed and the high-speed pinion and intermediate gear is totally enclosed and run in oil; other gears are encased and grease lubricated. The sleeve bearings, connecting rods bearings, and slides are grease lubricated by means of a Farval Manual system, a fully automatic system of lubrication can be provided.

The machine is controlled by push-buttons placed conveniently for the



*High-power bending and forging machine of 300 tons capacity manufactured by Joshua Bigwood & Sons Limited*

mediate shaft carrying a pinion at each end which mesh into a pair of gears, one on each side of the machine. These gears carry the crankpins which are coupled to the crosshead by substantial cast-steel connecting rods. The high-speed shaft runs in anti-friction bearings and the intermediate and slow-speed shafts in shell-type bearings of hard bronze; all shafts are of alloy steel.

All gears are machine cut, the pinions being of alloy steel, and the gears are of steel castings. Gears are fitted to the shafts, each by a pair of tangential keys of double wedge form, to provide the circumferential adjustment necessary to ensure correct tooth contact.

Lubrication of the machine has received careful consideration. The

operator. Four buttons are fitted; one for single stroking, when the ram starts from and returns to its retracted position; one for inching; one for continuous running, and an emergency stop. The clutch is pneumatically operated at an air pressure of 60 to 80 lb. per sq. in. The air supply is controlled by a solenoid-operated valve, which responds to the push-buttons, and in the case of single stroking, to a cam-operated limit switch. The machine has been designed for vibration-free smooth running and quietness of operation. Power consumption between strokes is claimed to be very low. To cater for both light and heavy types of work, machines of varying force of impact are supplied, ranging from 25 tons to 300 tons capacity.

### B.T.H. ELECTRIC EQUIPMENT FOR INDUSTRY.

—Electric traction equipment in service on all kinds of road and rail vehicles, including diesel-electric locomotives for main line and industrial transport, will be represented on the stand of the British Thomson-Houston Co. Ltd. at the British Industries Fair, Castle Bromwich. In addition to photographic reproductions of diesel-electric locomotives from 165 h.p. upwards for steel works, and shunting duties in various other large works, there will be a scale model of a 1,000-h.p. diesel-electric shunting and transfer locomotive. Ten of these locomotives are on order for

the New South Wales Government. An actual control desk with instrument panel for one of these locomotives is incorporated in a full-size replica of the driver's cabin, in which are included other control components and the brake valves, as well as the driver's seat. Other exhibits will include electric motors of many types for industrial machinery drives and motor control equipment. In the industrial research section, there will be a display of photo-conductive cells of a type now being used experimentally on the London Underground system as detectors of overheated axleboxes on trains.

INSTITUTE OF FUEL.—The annual corporate meeting of the Institute of Fuel will be held at 4.30 p.m. on April 23 in the Lecture Hall of the Institution of Mechanical Engineers, Storey's Gate, S.W.1. This will be followed at 5.30 p.m. by the Presidential Address of Dr. G. E. Foxwell, entitled "Fuel Technology and Civilisation." The annual luncheon will be held on April 24 at 12.30 for 1 p.m. at the Connaught Rooms, Great Queen Street, W.C.2, when the principal guest and speaker will be Sir John Hacking, President of the Institution of Electrical Engineers.

## New Electric Freight Locomotives for the Pennsylvania

*Automatic field control provides satisfactory commutation in a.c. motors over wide speed range*

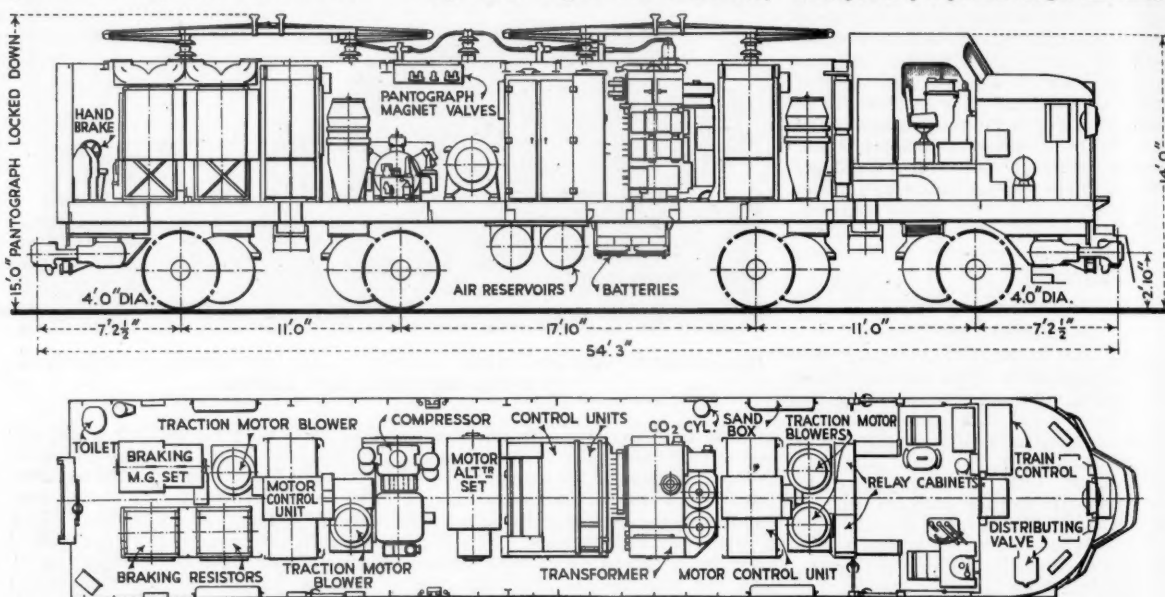
WHEN the renewal of electric freight motive power on the Pennsylvania Railroad came under review, the company gave full consideration to the use of converter locomotives or other types not operating directly on the a.c. power supply. It was decided, however, that for the type of service required a straight a.c. machine possessed advantages, such as the ability to operate at extremely high short-time ratings on overvoltage transformer taps for accelerating heavy trains and climbing gradients. Freight traffic on the com-

ment are shown in the drawings herewith. The locomotive ratings and other details are as follow:—

Weight in working order	107 tons
Weight per axle	26½ tons
Continuous horsepower rating per unit at 26.5 m.p.h.	2,500 h.p.
Traction effort, 25 per cent. adhesion	60,000 lb.
Continuous rating	35,400 lb.
1-hr. rating	38,400 lb.
Speed at 1-hr. rating	25.5 m.p.h.
Maximum speed	65 m.p.h.

Each locomotive unit consists of a streamline body with driving position at one end only, carried on two 2-axle swing bolster bogies. The entire body

commutating poles and compensating windings in the pole faces. In general principle a multi-pole motor with low flux per pole conforms to the design adopted for the types of traction motors used on the Pennsylvania since 1931, and has the advantage of being well suited to give the extra performance obtainable in single phase traction by the use of over-voltage taps on the transformer. Significant progress has been made in design since that time, as is evidenced by the fact that continuous horsepower per pound weight increased



Overall dimensions of a 2,500-h.p. unit for the new Pennsylvania freight locomotives, and plan view showing layout of the electrical equipment

pany's electrified lines was also studied over several years, and the conclusion was reached that the most convenient type of locomotive from the operational viewpoint would be a four-axle design capable of working singly or in combinations of two, three or four units.

A new class of freight locomotives based on the foregoing requirements is being built for the 11,000 V. 25-cycle single-phase system of the Pennsylvania Railroad by the General Electric Company. Two of them are now in traffic, as mentioned in an editorial note in our April 4 issue. Their characteristics have been described in a paper presented to the American Institute of Electrical Engineers by Messrs. F. D. Gowans, B. A. Widell, and A. Bredenberg of the Locomotive & Car Equipment Department, the General Electric Company, Erie, Pa.

Some dimensions of the locomotive and the layout of the electrical equip-

and underframe is fabricated from steel sheet, plates and sections. Internally, the apparatus is arranged so that there is an inspection aisle on each side. Hatch covers over the various items of equipment make them accessible from the roof.

### Body Structure

In this design the body side sheets form side trusses carrying the whole load. There is a consequent reduction of about 40 per cent. in the underframe material, against which there goes an increase of only 5 per cent. in side sheet material.

Two nose-suspended, axle-hung traction motors are accommodated in each bogie and drive through resilient gearwheels, with tubular synthetic rubber inserts, the gear ratio being 83:21. The continuous motor rating at 230 V. is 625 h.p., with a current of 2,640 A.

The motors have 16 main poles,

by 44 per cent. in the motors of 1934, 13 per cent. in the 1938 design and 26 per cent. in the current series. Various changes have been made in mechanical details to conform where possible with present-day constructional practice for d.c. motors. A revolving brush-holder yoke, shown in one of the accompanying illustrations, facilitates inspection and replacement of brushes.

Inside the locomotive the equipment for traction motor control and the motor blowers are located directly over the bogies so that busbar and cable runs are minimised, and the blowers discharge directly downwards into the motors. The transformer is located centrally and its tank is the full height of the cab so that the high-voltage bushing protrudes through an opening in the hatch cover directly under the front pantograph. An insulated busbar on the roof connects both pantographs to the Thyrite resistance lightning



*Two units coupled to form a 5,000-h.p. locomotive for freight traffic on the Pennsylvania Railroad. The locomotives were designed and built by the General Electric Company of the U.S.A.*

arrester and the transformer, so that 11,000 V. cable or conduit inside the body is eliminated completely.

A motor-operated main controller selects the 21 notches through the medium of electro-pneumatic contactors and tappings on the transformer secondary. A second motor-driven controller, operated through relays in the traction motor circuits, regulates the main and interpole fields at starting and low speeds. Power for the control circuits and battery charging is taken from a 37.5 V. d.c. generator connected to the auxiliary motor-alternator set. This machine is driven by a single-phase induction motor with pole-changing to give speeds of 750 and 1,500 r.p.m. Four blowers for the traction motors and two for the transformer are driven by three-phase motors connected directly across the alternator and consequently can be operated at half- or full-speed according to the speed of the motor driving the motor-alternator set. Either speed may be used at standstill, but normally full-speed operation is obtained automatically when the main controller reaches the fifth notch.

The other auxiliaries are driven by single-phase motors connected to tappings on the main transformer secondary and started by the split-phase resistance method. These machines include a motor-generator set giving a 10 V. output for exciting the traction motors during rheostatic braking.

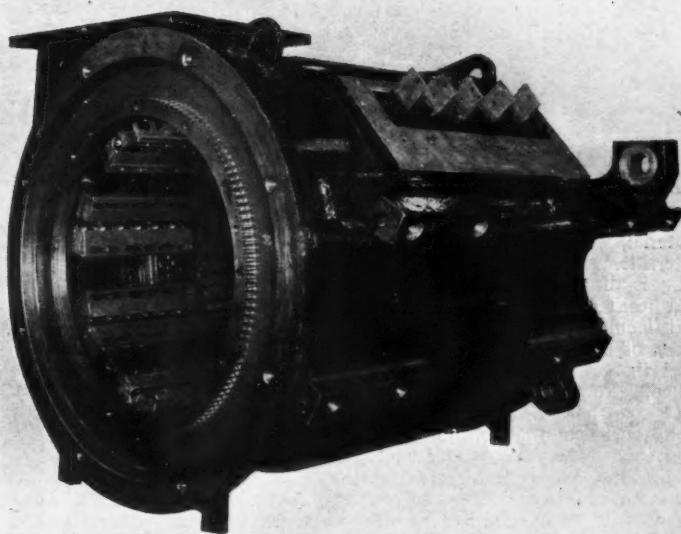
#### **Main and Interpole Field Shunts**

In a freight locomotive the commutation problem inherent in single-phase series motors is aggravated by the fact that there may be considerable periods

of low-speed running. Provision has been made in this design, therefore, for connecting several values of shunt across the commutating poles according to speed. In addition, the main field at starting is weakened to 40 per cent. of full strength by a combination of auto-transformer and inductive shunt. During acceleration the auto-transformer is cut out at 3 m.p.h. and the main field shunting is removed entirely at 7 m.p.h.

Three stages of shunting are used

across the commutating poles for the speed ranges 0-26 m.p.h., 26-40 m.p.h. and above 40 m.p.h., and take the form of resistive impedances of various values. A phase-angle motor type relay controls the main field excitation by taking up positions corresponding to the phase angle between the main transformer and traction motor field voltages, this angle decreasing as speed increases. The commutating pole shunting is controlled by d.c. relays operated through transformers and rec-



*Frame of traction motor with end cover removed to show the rotatable yoke that provides easy access to the brushes*



tifiers and responsive to a combination of traction motor current and voltage conditions.

Both motors in a bogie are in series, and the mid-voltage points of each motor circuit are interconnected in order to assist in equalising voltage and current between the four motors when slipping occurs. If current through the interconnection reaches a certain value, a relay operates a buzzer and warning light in the driving position; and a further increase trips the traction motor line contactors. Further relays operate on a difference in potential between the two motors in a bogie and perform similar warning and protective functions. These relays may come into action during rheostatic braking or when running with one pair of motors cut out, the interconnecting link being open-circuited in both conditions.

These locomotives are the first straight a.c. design in the United States to have rheostatic braking. For this purpose the armatures of each pair of motors are connected in series across a constant-value braking resistor. The four fields are excited in series by the 10 V. motor-driven generator mentioned above. Its shunt field is supplied from the d.c. control circuit. Braking effort is regulated in seventeen steps by control of the generator field.

During braking the traction motors operate as separately-excited d.c. generators. For good commutation it is necessary to shunt part of the braking current out of the interpole fields. This is done by using part of the resistor permanently connected across this field. The other section of the resistance is in series with the field and prevents changes in interpole winding tempera-

tures causing appreciable variations in the amount of shunted current.

A d.c. motor-blower set is connected across each braking resistor so that its speed is controlled by the braking current. A voltage relay across each braking resistor operates a warning light and buzzer if necessary.

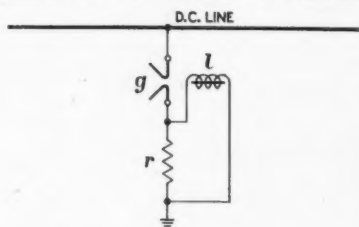
While the locomotive is rated continuously at 625 h.p. per axle, 26.5 m.p.h., it will accelerate trains up to 33 m.p.h. at 25 per cent. adhesion, corresponding to 1,300 h.p. per axle, and haul tonnage trains at 41.5 m.p.h. over ruling gradients at 16 per cent. adhesion, or 1,060 h.p. per axle. The locomotive incorporates as far as possible components that can be used in many other types so that the advantages of advanced design have been combined with the benefits of repetition manufacture.

## Lightning Protection for d.c. Rolling Stock

*Units with non-linear resistance characteristics*

WHEN a voltage surge induced by lightning on a d.c. traction system is discharged by an arrester, the arc caused by the follow-current has to be extinguished. Recent developments in arresters incorporating non-linear resistance materials have contributed to effective limitation of this current, and consequently of the residual voltage, with simultaneous extinction of the arc.

The principle of a Brown-Boveri arrester for d.c. rolling stock is illustrated in the accompanying diagram. Resistance  $r$  is formed of Resorbit



*Basic circuit of Type TBF arrester*

material, which has a non-linear characteristic. A voltage surge due to lightning is discharged through the gap  $g$  and resistance  $r$  without the blow-out coil  $l$  entering into the operation because of its high inductance. Immediately the voltage across the arrester has fallen,  $r$  reverts to a higher value, so that some of the d.c. follow-current from the traction system flows through  $l$  and produces a powerful blow-out field. The mean time for breaking the arc is about 0.01 sec.

An oscillogram published recently in the *Brown Boveri Review* shows the operation of one of these Type TBF arresters on a 4,000 V. d.c. system, when the follow-current did not rise



*Brown-Boveri Type TBF lightning arrester mounted on the roof of an electric motor coach*

above 39.5A. As a result of the characteristics of the Resorbit material, the increase of residual voltage with discharge current is slow and the arresters therefore afford a high degree of protection for rolling stock

The method of dealing with the follow-current in this type of arrester has allowed the amount of resistance material to be kept small and dispenses with moving parts, so that the unit is of compact construction.

## Electric Locomotives for Australia

*Designed for service in a brown-coal mining area where there is severe height restriction*

LAST year, electric locomotives of notable design were shipped to the State Electricity Commission of Victoria, Australia, for service in the extensive brown-coal mining area, where height restrictions are severe. As in similar locomotives built in Germany for many years, and including some 45-ton locomotives for the same user in 1936, a double-bogie design with cab dropped between the bogies and pantographs mounted on each end-casing has been adopted.

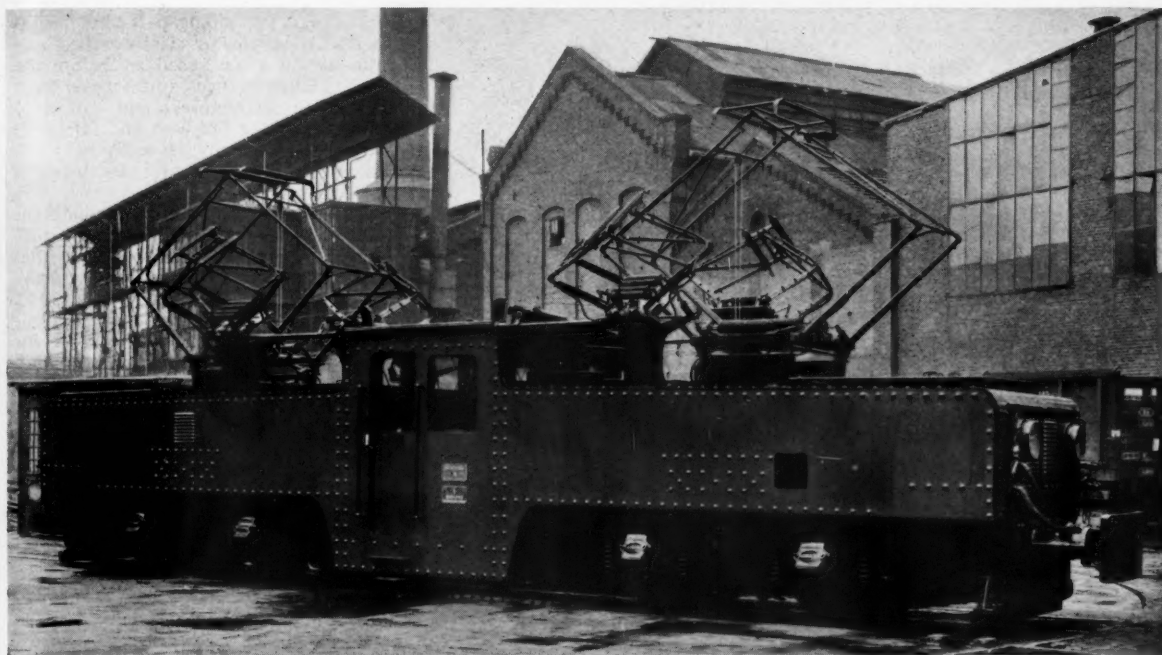
The bogies themselves are of the type wherein weight is carried by spring-

loaded side-bearers. The plain-bearing axleboxes have independent overhung laminated springs with strong helical auxiliaries. Knorr air brakes apply two blocks to each wheel through clasp rigging.

The overhead line system is at 1,100 volts d.c. Because of space limitations the catenary cannot always be carried above the centre of the track, and in some places is at an angle of about 60-65 deg. to it; therefore, the locomotive is equipped with six pantographs, as shown in the photograph reproduced below, each end having a main double-

pan vertical structure for the main-haulage sections of the line, and a smaller double-pan pantograph tilted over at each side, all being air-operated and spring-controlled. The Siemens-Schuckert organisation was responsible for the electrical equipment.

These locomotives run on 900 mm. (35½ in.) gauge tracks and have four traction motors with a total rated output of 344 kW. Weight in working order is 60 tonnes and top running speed is 30 km.p.h. (18.6 m.p.h.). Starting tractive effort at 33 per cent. adhesion is 39,500 lb.



*Henschel-built special-service 460-h.p. 1,100-volt d.c. locomotive for Victoria*

**NEW STOCK FOR GÖRNERGRAT RAILWAY.**—Two high-capacity lightweight motor coaches are being delivered to the metre-gauge rack railway between Zermatt and Gornegrat. The mechanical part has been built by the Swiss Locomotive & Machine Works, and the electric equipment by Brown, Boveri. The coach is 45 ft. 10½ in. long and weighs 18 tonnes. It accommodates 110 passengers (56 seated, 54 standing). The h.p. of 260 enables the distance of 5½ miles to be covered in about 25 min. less than the time, approximately 1 hr. 50 min., required by the locomotive-operated trains. Ascending, the speed of the new coaches will average 9 m.p.h. and descending 9½ m.p.h. The line rises from 5,265 ft. at Zermatt to 10,132 ft. at Gornegrat, with maximum gradients of

1 in 5. The lightweight construction of the coaches enables the weight per passenger to be reduced to 352 lb. compared with 484 lb. in the locomotive-hauled trains. The price of each coach is fr. 360,000, compared with that of fr. 300,000 for two similar coaches placed in service in 1947. To reduce to a minimum stopping time at the four intermediate stations, three doors have been provided, all on one side; the central door is particularly wide to facilitate rapid alighting and boarding with ski equipment. It is believed that with four locomotive-hauled trains and four large-capacity motor coaches in service it will be possible to cope satisfactorily with the heaviest traffic which occurs generally at Easter, when up to 3,300 ascending passengers per day have been counted.

**EXIDE BATTERIES AT THE B.I.F.**—A display of typical Exide-Ironclad batteries for electric trucks and vehicles of all kinds will be featured on the stand of Chloride Batteries Limited at the British Industries Fair, Castle Bromwich. Another important section of the stand will be devoted to Keepalite, automatic emergency lighting apparatus. The Exide-Ironclad type of cell supplied for use with marine Keepalite equipment will be exhibited. These batteries can be tilted through at least 22½ deg. on either side of the perpendicular without risk of acid spillage. A train lighting cell will be seen with small dry batteries for radios and hearing aids. Exide Standard and "Double-Life" car batteries will stand side by side with Exide-Ironclad and heavy duty transport types.

## Japanese Railway Progress

*Modernisation plans include great increase in electrification, permanent way improvement, and more all-steel stock*

*(From a Correspondent)*



*Approach to Tokyo Central Station from the north*

THE Japanese National Railways, with 12,257 route-miles of line serving a population of some 85,000,000, took their present title in May, 1948, and since June, 1949, have been administered by a public corporation. Previously they were known as the Imperial Government Railways, which came into being after the passing of a law of 1906 nationalising the seventeen main private companies. A general description of the system, and the effects of the war on it, was given in our May 26, 1950, issue.

After the war the railways faced an

acute shortage of rolling stock and their plant and track had deteriorated. The occupation authorities had requisitioned part of the efficient equipment that remained. Their recovery has been nevertheless rapid. Last year, locomotives totalled 5,458—slightly more than before the war; coaches (11,394) and wagons (105,862) were both back to prewar totals. The number of passengers carried during the 1950-51 fiscal year was 3,095,194,170, an increase of nearly one-third over ten years before; revenue freight tonnage during the same period totalled

120,192,897 tons. Revenue from passengers and freight combined aggregated over 126 billion yen, equivalent to £126,000,000. Employees of the system in 1951 numbered 473,000. Coal consumed amounted to 5,222,093 tons, costing £20,765,000; electricity consumed was 742,292,550 kWh.

### Express Services

The railways are gradually regaining their prewar capacity, facilities, and speeds. Two limited express trains, "Tsubame" ("Swallow") and "Hato" ("Dove"), operate daily between Tokyo and Osaka. They include observation cars, dining cars, and reclining seats in second class coaches, and run at the same speed as before the war. Other luxury expresses run from Tokyo to Shimonoseki and Tokyo to Aomori, in the far west and far north of the mainland respectively. The rolling stock of the ordinary trains is gradually being improved.

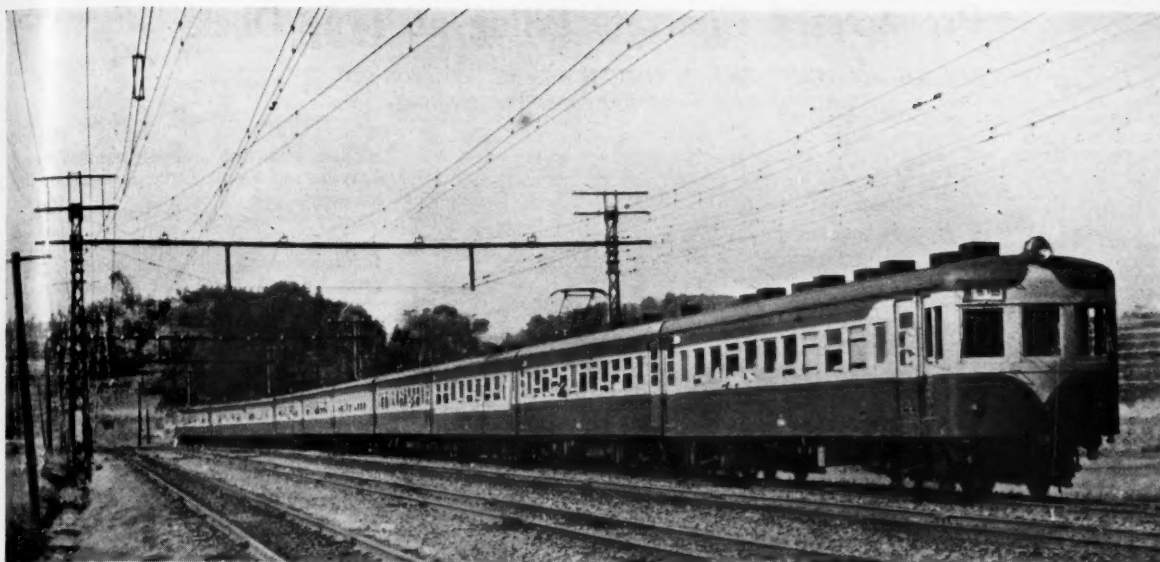
This return to near-normal conditions has been achieved in the face of difficulties. A traffic survey shows that last November more than twice as many passengers were carried as in 1936, although the number of coaches available was only  $1\frac{1}{2}$  times the total for that year. This indicates the strain being put on the railways by the great increase in population since the war.

As Japan is short of coal but has abundant possibilities for producing hydro-electric power, a primary objective is to extend main-line electrification. It is planned to electrify 70 more miles of line during the coming year, and 700 additional miles in the next five years. The immediate aim is to complete electrification between Tokyo and Shimonoseki.



*(Left) dining car, and (right) second class coach with reclining seats, on "Tsubame" express between Tokyo and Osaka*





*Post-war multiple-unit train on Shonan line*

Electrification began in 1906, when the Government bought an electric line between Ochanomizu and Nakano,  $5\frac{1}{2}$  miles long, from the Kobu Railway Company, which now forms part of the main Shuo Line. Electrification was then extended to sections around Tokyo and to a steeply graded section over the Usui Pass. After the Government bought, under the Transport Control Law during the recent war, electrified lines owned by private companies, the electrified sections of the National Railways totalled 1,021 miles in 1950.

Multiple-unit service covers 269 miles; electric locomotive service 240

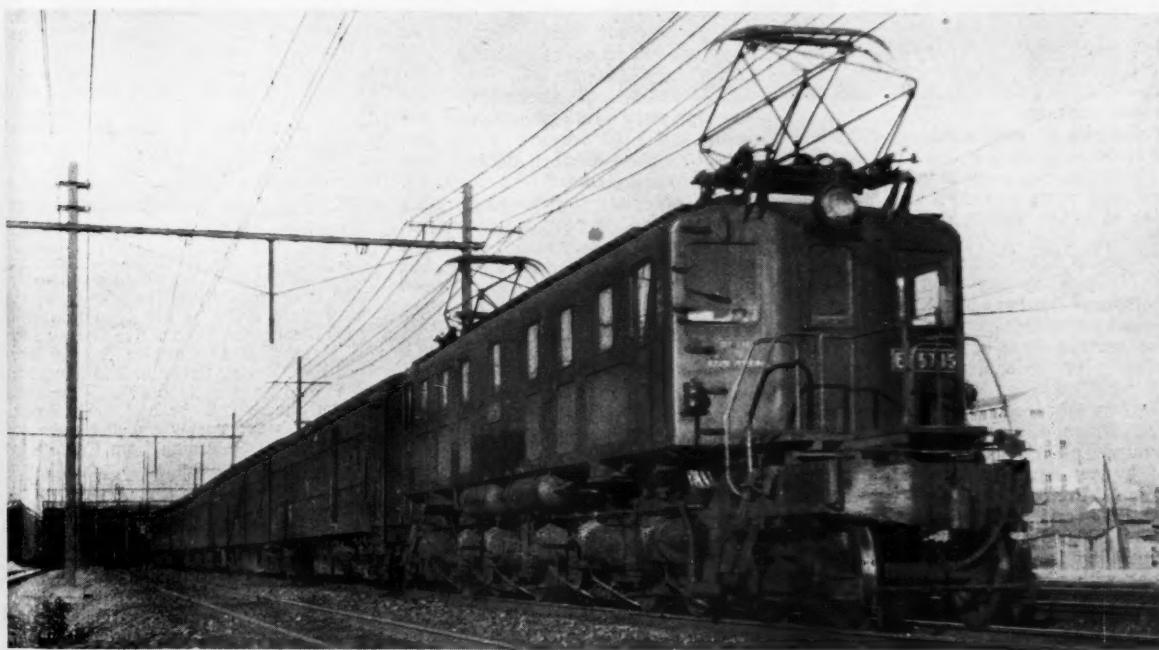
miles; and joint service 513 miles. The 1,500 V. d.c. sections total 927 miles; 1,200 V. d.c., 50 miles; and 600 V. d.c., 44 miles.

A recent report said that Japan ranks eighth in electrified mileage in the world and ninth in ratio to the total mileage operated. In the interests of the rational use of coal and hydro power, the resources of industrial activity, and of improved service and capacity of the National Railways, further electrification of some 4,336 miles is expected. After completion, the electrified sections of the National Railways will amount to 5,357 miles; the ratio to

the total operating mileage will then be 43.7 per cent., nearing the ratio of the Swedish State Railways (47.7 per cent.).

In the earlier stages of electrification, the report continues, as d.c. conversion by rotary machines required a 25-cycle a.c. power supply, the National Railways installed a thermal plant of 3,000 kW output (6,600 V., 25-cycle) at Yokokawa to feed power to the section over the Usui Pass; and another thermal plant of 6,000 kW output (11,000 V., 25-cycle), using Monde gas, near Tokyo. Later, with the progress of techniques,

*(Continued on page 438)*



*Main line train hauled by 2-C-C-2 locomotive*

## Pre-stressed Concrete Piling at Tyne Dock

*Construction of curtain wall at new iron ore quay of the Tyne Improvement Commission*



*A load of pre-stressed piles ready to leave the works at Tallington for the iron ore quay at Tyne Dock*

**I**NCREASING interest is being shown in the possibilities of economy in material and maintenance arising from the use of pre-stressed concrete. A recent application of pre-stressing is seen in the pre-stressed concrete sheet piles forming a curtain wall at the new iron ore quay at Tyne Dock.

The piles are 40 ft. long, with a section of  $23\frac{1}{2}$  in.  $\times$  9 in. A tongue

and groove is formed on the narrow faces of the piles, so designed as to permit the introduction of a seal of colloidal grout between each pile and its neighbour after driving. There are 84 No. 0.2 in. dia. high tensile wires in each pile, and additional mild steel is provided in the head and toe as well as stirrups throughout the length of the pile. The head is slightly reduced in

section and the toe is pointed and bevelled so as to force it against the adjacent pile and maintain contact during driving.

The permissible tolerances in manufacture were  $+0 - \frac{1}{8}$  in. on the broad face and 1/1,000 of the length in straightness. No shoe is fitted. The piles were manufactured at the Tallington works of Dow-Mac (Products) Limited, and one from each cast was subjected to a specified bending test, which was withstood without the concrete cracking.

Each pile weighed approximately four tons and was marked with the correct lifting point before despatch. The driving was done by the main contractor, the Yorkshire Hennebique Contracting Co. Ltd., with a 3-ton single acting hammer, the drop being 4 ft. Bolt holes in the piles were not permitted, the piles being held in the frame leaders by means of clamps.

Hard driving conditions were experienced, up to 150 blows per ft. of penetration being required in many instances. Despite this, the damage to the heads of the piles was negligible. The piles were designed by the joint engineers, Mr. R. B. Porter, Chief Engineer, Tyne Improvement Commission, and Messrs. Rendel, Palmer & Tritton, Consulting Engineers, through whose courtesy the photographs of the loaded piles is reproduced.

### Japanese Railway Progress

*(Concluded from page 437)*

rotary converters became available for inputs of 50 and 60 cycles, and the power stations near Tokyo and at Yokokawa were abolished in 1926 and 1931 respectively.

With the increased demand for power resulting from extension of electrification in Toyko and its vicinity, power is supplied from a hydro station constructed at Senju, on the Shinano River (in Niigata Prefecture), and thermal stations at Akabane and Kawasaki near Toyko. Further increases of consumption such as those of recent years could cause a power shortage, and the estimated demand on projected electrification on the Joetsu, Takasaki, Tohoku and Joban Lines, with the sections around Tokyo, dictated the construction of a new hydro plant at Yambe, in Niigata Prefecture. This was begun in 1948 and now supplies an additional 500,000 kW of power. Its turbo-generators are specially designed to cope with abrupt fluctuations of load. Other up-to-date designs were adopted to generate dependable power at low cost.

The National Railways budget for the

1951 fiscal year provided the equivalent of £12,000,000 for construction of new motive power and rolling stock, including 12 electric locomotives, 100 electric coaches, 77 internal combustion locomotives operating on petroleum, 155 coaches and 5,707 wagons. Other improvements planned when funds permit include changing from 37 kg. to 50 kg. rail as a necessary step to accelerating schedules; and the improvement of gradients and curves. Priority is being given to replacing old wooden coaches (60 per cent. of the total now in use) by modern steel stock, and the light locomotives by heavier types.

**THE BRITISH OXYGEN CO. LTD. EXHIBIT AT B.I.F.**—At the British Industries Fair in Castle Bromwich from May 5 to 16 the British Oxygen Co. Ltd. exhibits will include a complete range of cutting and welding blowpipes, and, for light welding and lead-welding, Oxy-acetylene, acetylene-air and air-hydrogen blowpipes. Among cutting machines displayed will be Cutogen models Nos. 1 to 5, the recently modified 36 in. universal cutting machine which incorporates such refinements as a new transmission and a cutter which enables the machine to be easily converted to powder cutting operation when profiling stainless steel; and the 55 in. universal cutting machine, also modified. Portable

welding outfits, consisting of blowpipes, regulators and oxygen and acetylene cylinders mounted on lightweight trolleys will be displayed. Rods and fluxes for welding, building up and hardfacing will be available for most ferrous and non-ferrous metals and the majority of alloys in both classes. The Argonarc process will be featured, with additional equipment which includes a water-cooled shield on the Mark III torch for continuous heavy-duty work.

**RAIL TOUR IN THE POTTERIES.**—A tour by special train of lines long closed to passenger traffic in the territory of the former North Staffordshire Railways has been arranged by the Stephenson Locomotive Society and the Manchester Locomotive Society for April 26. Leaving Crewe at 2.16 p.m., the route will be via Sandbach, Wheelock, Lawton Junction, Stoke and Leek Brook Junction up the steeply-graded branch to Caldon Low. Returning from Caldon to Leek Brook the train will proceed via North Rode to Congleton Junction, Bidulph, Milton Junction, Stoke, Silverdale and Leycett to Alsager East Junction, and forward to Crewe, due at 8 p.m. To give a pre-grouping aspect an ex-Lancashire & Yorkshire 2-4-2 side tank locomotive will work the train. Further details may be obtained from the Hon. Chairman of the organising committee, Mr. H. D. Bowtell, 29, Langdale Road, Victoria Park, Manchester, 14.

## RAILWAY NEWS SECTION

## PERSONAL

Mr. Robert F. Duncan has been appointed Assistant General Manager of the Hotel Department, Canadian Pacific Railway.

Mr. A. W. Manser, B.Sc., A.M.I.Mech.E., Assistant Mechanical Engineer (Works—Railways), London Transport Executive, who, as recorded in our March 28 issue,

(Acton Works), becoming Assistant Mechanical Engineer (Works), with the rank of officer, in 1947.

Mr. J. V. Santry has been appointed a Director of the Superheater Co. Ltd., in place of Mr. F. R. Fitzpatrick.

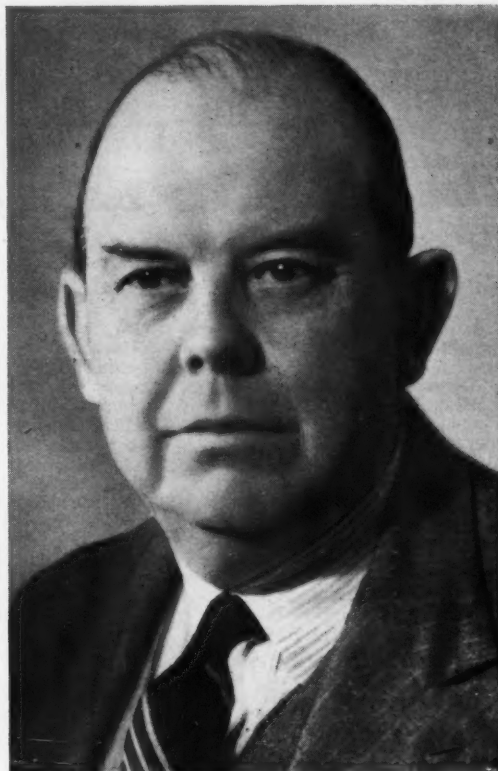
Sir James Grigg has been appointed a Director of the Consolidated Signal Co. Ltd.

Works Department, later the Indian Railway Service of Engineers. For the next nine years Mr. Laughton was engaged on survey, construction, and open-line maintenance work on the former Oudh & Rohilkund (State) Railway, now part of the East Indian Railway; during the latter part of that period he was Executive Engineer. He was Personal Assistant to the Chief Engineer from 1919 to 1921, and then was appointed Superintendent of



*Mr. A. W. Manser*

Appointed Chief Mechanical Engineer (Railways), London Transport Executive



*The late Mr. G. C. Laughton*

General Manager, Bombay, Baroda & Central India Railway, 1942-44

has been appointed Chief Mechanical Engineer (Railways), is 46, and was educated at Aske's Hatcham School and King's College, London. He entered the service of the London Electric Railway Company as a temporary engineering cadet in 1929, being appointed indoor assistant to the Superintendent of Lifts & Escalators in 1933. In 1938 he was appointed Depot Engineer at Golders Green depot, subsequently becoming a Senior Depot Engineer. Mr. Manser entered the R.N.V.R. at the end of 1940 with the rank of Temporary Sub-Lieutenant in the Electrical Branch. After being employed on experimental work he served in the Mediterranean theatre during the Sicilian invasion, with the Normandy invasion forces and also in the Far East. At the time of his release in 1945 he held the rank of Commander in the Electrical Branch; his was the first promotion in this branch of the R.N.V.R. to the rank of Commander. On rejoining London Transport Mr. Manser was appointed Senior Production Engineer

Mr. W. M. Bond, Assistant, Permanent Way (Maintenance), to the Civil Engineer, London Midland Region, is retiring on April 19.

Mr. R. M. Grant has been appointed Assistant Manager of the Plant Sales Department, Rugby, British Thomson-Houston Co. Ltd.

We regret to record the death on April 13, at the age of 65, of Mr. G. C. Laughton, C.I.E., A.M.I.C.E., M.Inst.T., A.C.G.I., J.P., General Manager of the Bombay, Baroda & Central India Railway, 1942-44. He was educated at Seafeld Park College and passed into the City & Guilds Central Technical College, South Kensington; he graduated as A.C.G.I. in 1909. He gained practical experience under the Chief Engineer of the former London & South Western Railway, and in 1910 was appointed by the Secretary of State for India to be an Assistant Engineer in the Railway Branch of the Indian Public

the Kalka-Simla Railway, which position he held until 1925. On transfer to the North Western Railway he was appointed Divisional Engineer, and in 1926 he was promoted to Divisional Superintendent. For a short time Mr. Laughton was Superintendent of Works, and, in 1929, became Deputy-Director of Civil Engineering with the Railway Board; he was appointed Director in 1931. After a short time as Secretary to the Railway Board in 1932 he was appointed Senior Government Inspector of Railways, Circle No. 7, Madras, with headquarters at Bangalore, which post he vacated to accept that of Deputy-Agent of the Bombay, Baroda & Central India Railway. After a short period in this position, he was appointed, in 1938, Agent & General Manager; he relinquished the position of Agent when he became General Manager of the railway in January, 1942. He retired as General Manager in 1944. Mr. Laughton was Deputy Chief Controller, Railway Branch, Control Commission in Germany, 1945-46.





**Mr. Antonio Sansogni**

Appointed Chief of Traffic Department,  
General San Martin Railway,  
Argentina

Mr. Antonio Sansogni, Chief of the Operating Division & Principal Assistant to the Traffic Manager, General San Martin Railway, Argentina, who, as recorded in our February 29 issue, has been appointed Chief of the Traffic Department, started his railway career in 1905 as Assistant at Castellano Station, Buenos Ayres & Pacific Railway. He was transferred to Buenos Aires in 1910, joined the Movement Office in 1912, and became Assistant Chief of the Palermo Movement Office in 1931. Six years later he became Chief of the Mendoza Movement Office and the next year was transferred to Palermo in a similar capacity. In 1949 he was promoted Chief of the Operating Division & Principal Assistant to the Traffic Manager.

We regret to record the death on April 9, at the age of 85, of Mr. F. W. Galton, who was a Member of the Royal Commission on Transport, 1929-30.

Mr. W. D. Lorimer, Joint Managing Director of the North British Locomotive Co. Ltd., who has been attending the international economic conference in Moscow, arrived back in London by air on April 11.

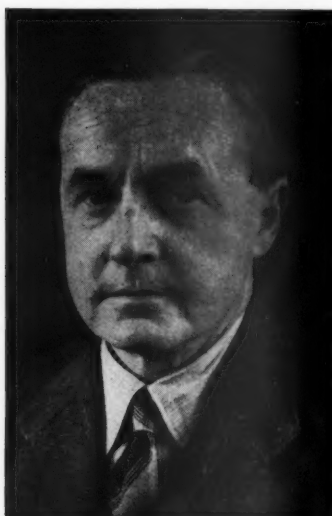
We regret to record the death on April 8, at the age of 77, of Mr. E. S. Shrapnell-Smith, C.B.E., F.C.S., M.Inst.T., the Senior Director of the East Kent Road Car Co. Ltd., and a Director of the Aldershot & District Traction Co. Ltd. He had been a Member of the Road & Rail Traffic Appeal Tribunal since its formation in 1934.

#### SOUTHERN REGION APPOINTMENTS

The following appointments have been announced by the Southern Region:—

Mr. N. L. Collins, Assistant District Traffic Superintendent, Orpington, to be District Traffic Superintendent, Exeter, in place of Mr. G. Bishop, who is retiring on April 30.

Mr. B. R. M. Barr, Assistant Marine Superintendent, Parkeston Quay, Eastern Region, to be District Marine Manager, Dover, in place of Mr. T. W. D. Abell, who has resigned.



**Mr. J. S. Scott**

Appointed Locomotive Works Manager, Gorton,  
London Midland Region

Mr. J. S. Scott, A.M.I.Loco.E., Acting Locomotive Works Manager, Doncaster, Eastern Region, who, as recorded in our March 28 issue, has been appointed Locomotive Works Manager, Gorton, London Midland Region, was educated at Woodside High Grade School and the Royal Technical College, Glasgow, and began his railway career as an apprentice on the Caledonian Railway at St. Rollox Works in 1918. Subsequently he became Chief Works Inspector and Senior Assistant in the machine, wheel and fitting shops. In 1939 Mr. Scott was appointed Works Superintendent, Barassie Wagon Works, and was responsible for the reorganisation of the workshops for the complete repair of "Spitfire" fighter aircraft during the recent war. In 1948 he was appointed Locomotive Works Manager, Cowlares, and three years later became Acting Locomotive Works Manager at Doncaster, Eastern Region. Mr. Scott was the Honorary Secretary of the Scottish Section of the Institution of Locomotive Engineers for 16 years.

The election of Mr. T. S. Lascelles as President of the Institution of Railway Signal Engineers was announced in our April 11 issue. The following have also been elected to the Council for 1952:—

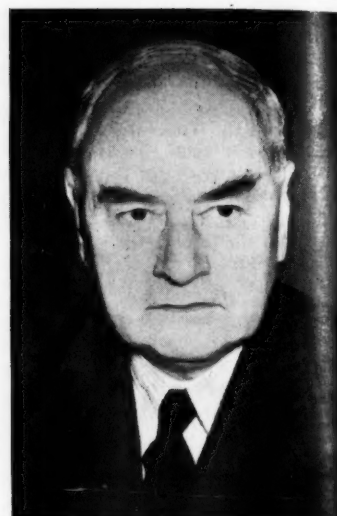
*Vice-Presidents:* Mr. T. Austin and Mr. J. H. Fraser. *Members of Council:* Messrs. E. G. Brentnall, F. Burton, C. G. Derbyshire, F. B. Egginton, F. G. Hathaway, J. C. Kubale, W. Owen, D. G. Shipp, J. F. H. Tyler, A. F. Wigram, R. A. Green, M. Le Sueur, Messrs. F. Mann, N. Marshall, A. L. Mills, R. A. Powell.

The London Transport Executive has announced the following appointments in the Department of the Operating Manager (Railways), with the rank of Principal Executive Assistant:—

Mr. T. F. Eldridge to be Divisional Superintendent "A," responsible for the Metropolitan and Bakerloo Lines.

Mr. G. Yorke to be Divisional Superintendent "C," responsible for the District and Piccadilly Lines.

Mr. F. E. Birch to be Divisional Superintendent "D," responsible for the Central Line.



**Mr. H. P. Aggleton**

District Goods Manager, Manchester, L.M.S.R.  
& District Goods Superintendent, Manchester,  
L.M. Region, 1945-52

Dr. T. B. Ferguson has joined the staff of the Regional Medical Officer, British Railways, Scottish Region, Glasgow.

Mr. H. P. Aggleton, who earlier this year retired as District Goods Superintendent, Manchester, London Midland Region, recently attended the Commercial Superintendent's Conference and was presented with a cheque by Mr. A. E. Hammett, Commercial Superintendent, on behalf of his colleagues. Mr. Aggleton joined the L.N.W.R. as a superior apprentice at Watford in 1905, and received training in various departments. His first senior appointment was Goods Agent at Northampton in 1921, and he later occupied a similar position at Coventry from 1922 until 1929, when he was promoted Commercial Assistant to the District Goods Manager, Birmingham, L.M.S.R. In 1935 Mr. Aggleton went to headquarters in London as Head of the Goods Revenue Section, and went to Manchester as Assistant District Goods Manager in 1938. He was appointed District Goods Manager at Warrington in 1939 and returned to Manchester in 1945 as District Goods Manager. Mr. Aggleton, who was well known to the Manchester business community, was a Director of the Manchester Chamber of Commerce, and served on a number of committees associated with transport. Between 1950-52 he was the Member (Railways) to the Transport Users' Consultative Committee, North Western Area. Among Mr. Aggleton's activities is a keen interest in the British Legion, and he is President of the British Railways Branch, Manchester, the only British Railways Branch in the country, and Past President of Coventry No. 2 Branch. He enlisted in the 3rd County of London Imperial Yeomanry in 1905 and was later commissioned in the Royal Engineers. During the 1914-18 war he served with these Regiments in France, and later in North Russia with the North Russian Expeditionary Force. Mentioned in despatches and awarded the Order of St. Stanislaus with Swords and Ribbon, he was gazetted out of the Army with the rank of Major in 1919. Mr. Aggleton joined the Local Defence Volunteers from the outset, and was a Major when the stand down came in 1944.

## Ministry of Transport Accident Report

Doncaster, March 16, 1951:  
Eastern Region, British Railways

Lt.-Colonel G. R. S. Wilson, Chief Inspecting Officer of Railways, and Brigadier C. A. Langley, Inspecting Officer of Railways, Ministry of Transport, inquired into the accident which occurred at about 10.9 a.m. on March 16, 1951, at Doncaster, when the 10.6 a.m. express from Doncaster to Kings Cross, comprising 14 bogie coaches and a horse box, drawn by the 4-6-2 type locomotive *Cock o' the North*, was derailed as it passed through a scissors crossover at 20 to 25 m.p.h. The engine and the first two coaches remained on the line but the next eight came off the track and the rear of the third was diverted to the left, resulting in its being carried forward broadside on and crushed to destruction against the pier of Balby Road bridge. The remaining derailed coaches were damaged in varying degrees.

Fourteen passengers lost their lives and 12 were detained in hospital with serious injuries; 17 sustained minor injuries or shock, of whom six received hospital treatment. Fortunately there was no lack of ambulance-trained staff, and excellent rescue arrangements were at once organised. The first casualties were extricated within two or three min. and the first ambulance left within half-an-hour. The East Coast route became blocked and goods traffic had to be temporarily suspended. The down goods and up and down main lines were cleared the same day, but the up goods lines were not until 5 p.m. two days later. The scissors crossing itself was restored the following morning. It was fine, with dry rails after slight frost during the night.

The accompanying drawings taken from, or based on, those in the report, enable the essential facts to be ascertained. Local circumstances led to the crossover being at a place where the up main was on a curve with 4-in. superelevation and cant through the trailing lead from the slow line to be run up steeply between the "V" crossing and the switches. In 1947 a speed restriction of 10 m.p.h. was imposed for the whole length of the up slow line from the station platform to Bridge Junction; previously a standard 15 m.p.h. restriction through the crossover was in force. There is an average of about 42 movements daily up slow to up main and 94 along the up main, including a considerable number of expresses at up to 60 m.p.h.

### Locomotive and Train

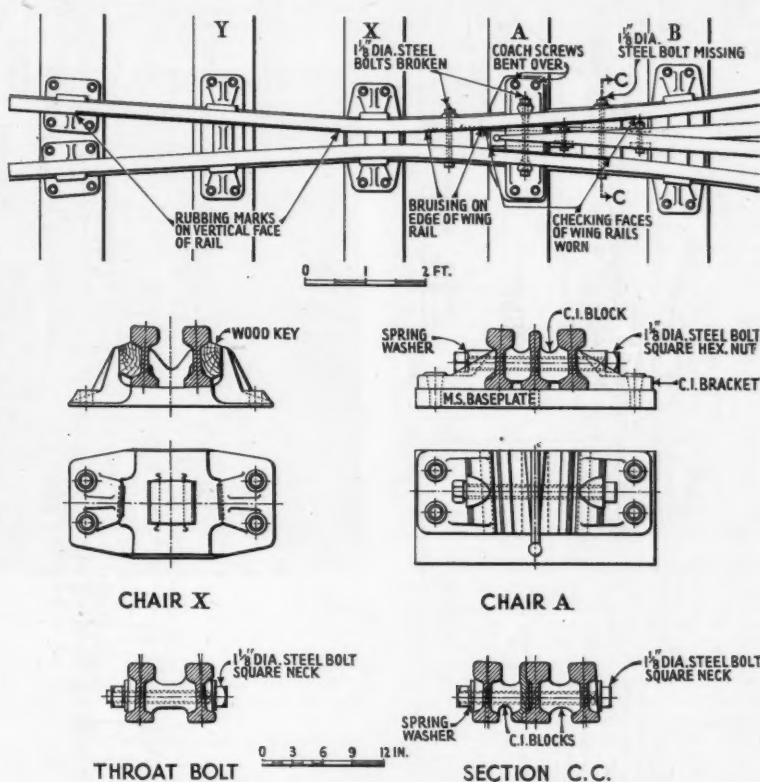
The locomotive *Cock o' the North* was built in 1934 as a 2-8-2 and converted to Pacific type when rebuilt in 1943. It had an intermediate heavy repair in February, 1951, and had run 3,000 miles since. Nothing could be found to show that its condition could have been in any way responsible for the accident. All coaches had steel underframes and nine, including the wrecked coach, had bodies framed in hardwood with steel exterior panels. The remaining five had all-timber bodies of pre-war construction. Buckeye couplings were in use throughout except that the engine and horse box were screw-coupled. Nothing could be found in the condition of any vehicle to indicate that it had originated the derailment from any defect in itself.

The express had gathered speed slowly and the engine and first two coaches passed the crossover. Either the rear bogie of the third or front bogie of the fourth be-

came derailed to the left just as it cleared the trailing "V" crossing of the up main connection, and the bogies of the next six vehicles followed suit. When the third hit the bridge the pull of the engine and thrust from the following coaches wrapped it round the pier. The underframe became bent into a "U" and the body was demolished. The snatch was so great that the pin of the coupling was sheared in two places. A force of nearly 100 tons was required to do that. The front end of the fourth coach also was crushed and its corridor ripped open. All the derailed wheels were examined for markings on the tyres, and most had indentations, serrations and rubbings to a greater or lesser

each wing rail and was fastened to the crossing timber by two coach screws through each bracket. The wing rails at this point were separated from the nose by cast-iron blocks. The whole assembly was secured by a 1½-in. bolt, 15½ in. long. This is the A chair bolt.

The third bolt, 1½ × 14½ in. passed through the wing and crossing rails half-way between the A and B chairs, the clearances being maintained by cast-iron blocks. The rails in the X, Y and B and other chairs were secured by hardwood keys. Crossing timbers were 12 in. wide and 6 in. deep and continuous under all rails as far as the Y chair, after which there were separate timbers for the two



Constructional details of trailing "V" crossing

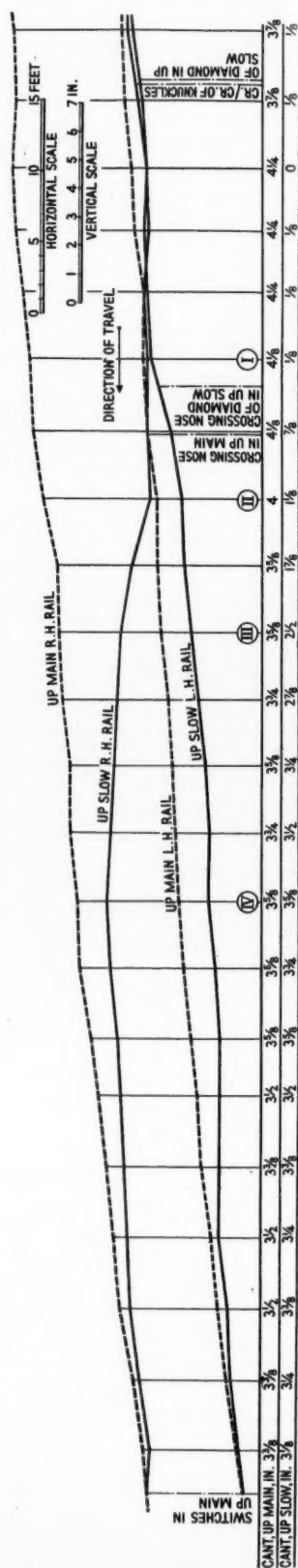
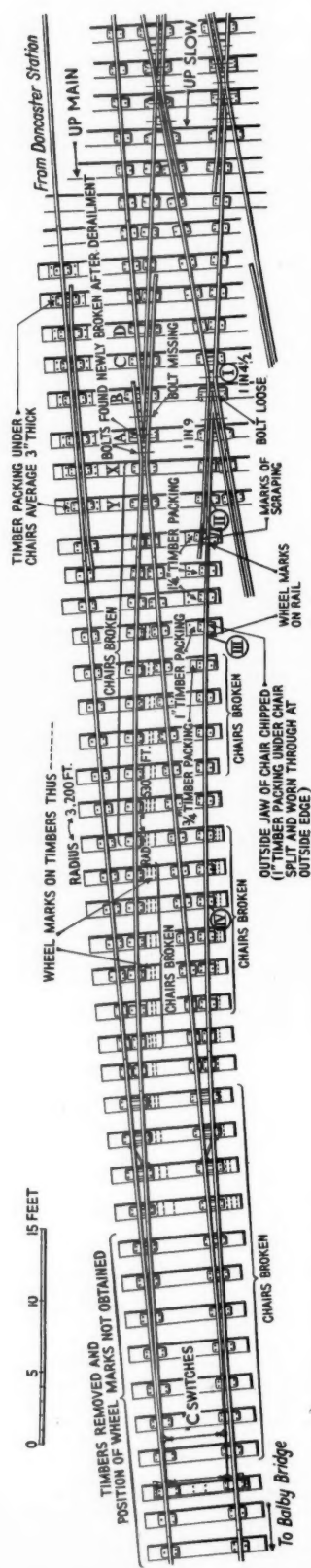
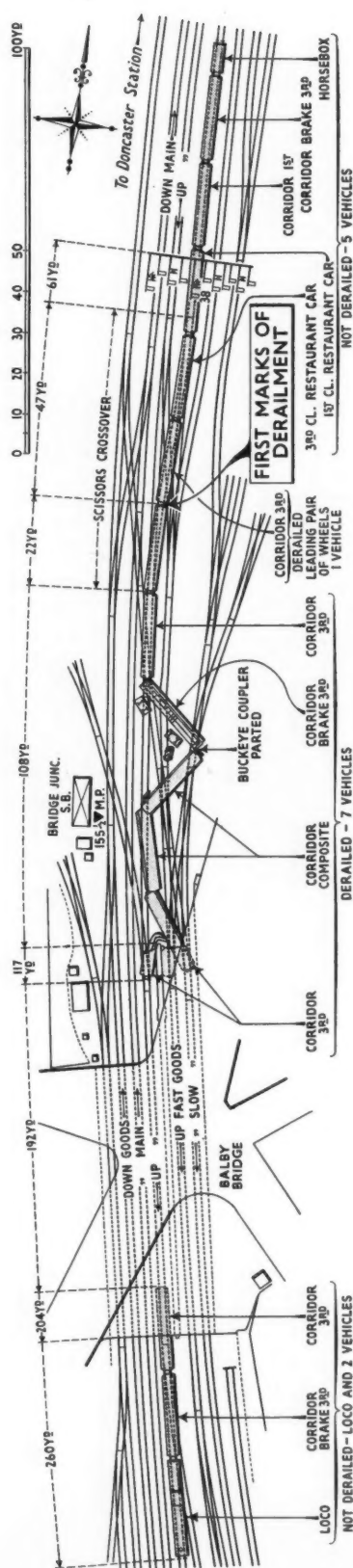
degree where they had struck the rails, chairs, and so on. The only significant markings were on the right-hand wheels of the fourth coach.

### The Track

The constructional details and other important features of the crossover are to be seen on the drawings. The crossing was of standard design held together by three transverse bolts and carried in a number of special chairs, two under the splice and two just ahead of the throat. The wing rails at the throat were secured by a 1½-in. dia. bolt, 11 in. long, through the rail webs and distance piece. The built-up chair A consists of mild steel base plate with cast-iron brackets on the outside of

halves of the scissors. Hardwood packing pieces varying in thickness from 1½ to ¾ in. were placed under the chairs of the left-hand slow line rails to counteract the effect of the main line cant and 3-in. packing pieces had been inserted under the high rails of the main line on the long timbers opposite the trailing crossover, to give the requisite cant without affecting the other lines.

The whole layout was renewed with 100-lb. bullhead rails on new timbers in January, 1940, and was completely re-ballasted with slag to a depth of 9 in. below sleepers in November, 1949, before which there was considerable difficulty with drainage. Conditions have been much better since. A thorough repair was given





once a month and the crossover had received attention three weeks before the accident. Material generally was sound. The rails in the trailing crossover varied from 87.5 to 91.5 lb. compared with permissible maximum of 85 and had two to three years further life. Surfaces of the wing rails, where wheels had begun to take their bearing, were not unduly worn but back flange wear on the "checking" faces was  $\frac{1}{8}$  in. or more for some distance beyond the throat.

Sleepers were in good condition and coach screws holding well. There was no undue wear on the nose of the trailing crossing and slow line gauge there was correct, although the A chair had been slightly displaced. The bolt between A and B chairs was missing and there was a loose bolt in the opposite left-hand facing crossing, but it had no bearing on the derailment. The left-hand ends of the first three sleepers beyond the check rail showed signs of "pumping" and the outside of the fourth chair was bearing on the sleepers. The report gives details of the marks

The Department said: "Of all the defective bolts examined, whether already broken or as taken out of service and found cracked, it is evident that failure in the first instance is by fatigue and in many cases starts at the bottom of a screw thread. This cracking would be very difficult to see except after careful cleaning and examination under a powerful hand lens. In this respect all the defective bolts are similar to both of those from the scene of the accident, and where cracked but not broken were likely to break at any time under traffic."

#### Running of the Train

The evidence of the stationmaster and signalman at the South signalbox was to the effect that the train made a normal start, and the Bridge Junction signalman said it came towards him at 15 to 20 m.p.h. He felt it shaking the box and saw coaches rolling about. A signal labourer was working by the bridge and saw the coach swing off the rails and come straight for him. He had just time to jump clear before the

ing, nor the loose bolt in the right-hand facing crossing opposite, nor the pumping sleepers. The right-hand bolt was in place and the left-hand bolt was tight two days before. He noticed the pumping sleepers then and the worn packing pieces but considered them not sufficiently serious to warrant immediate attention. He had seen trains pass at up to 25 m.p.h. and did not know of the 10 m.p.h. restriction.

The permanent way inspector thought the derailment took place just clear of the left-hand check rail protecting the trailing crossing and had noticed no serious defects a day or two before. One or two pumping sleepers were hardly surprising after heavy rain; he saw no loose or missing bolts. A missing one would not unduly weaken the crossing and if all were out he would allow traffic through at 5 m.p.h. Two or three bolts were broken in his district weekly. That was not excessive where there were about 1,500 crossings in the running lines and yards. He could not account for the derailment. The engine, even if travelling considerably faster than was permitted, would not, he thought, have broken the two remaining bolts and burst the crossing.

#### Speed Tests

Three test runs were made with a train closely approximating to the composition and weight of the train involved, including load, hauled by the same engine, starting in the first case in the manner described by the driver. The speed of the second coach at the trailing end of the crossover was 17 m.p.h. In the second the driver was told to make a normal start for the up main line and after the end of that line beyond the platform the regulator was opened fully. Speed at the crossover was 23 m.p.h. In the third run the driver was instructed to make as fast a start as possible and managed to reach 25 m.p.h. at that point. One signalman at South box was emphatic that the third run was most representative of the day of the accident and the first a very poor effort, while the Bridge Junction man thought the train that came to grief passed him very much as in the second run, certainly a good deal faster than in the first.

Before these trials the Civil Engineer had timed a few passenger trains starting from the station along the up main via Doncaster South crossover and along the up slow via Bridge Junction crossover, with varying results: the highest speed noted was 28 m.p.h. for the thirteenth vehicle of a 14-coach train on passing the latter crossover. The rear of an 11-coach train reached 19 m.p.h. after being nearly stopped at Bridge Junction home signal.

When Colonel Wilson and Brigadier Langley were, with railway officers, inspecting the track four days after the accident, an express passed from slow to main at an estimated rate of 20 m.p.h. and a key in a trailing crossing X chair fell out. Other tests were made to ascertain the distance in which the train would stop from different speeds by a breakaway brake application. Eight runs were made with reversing gear at 15 per cent. cut off in each case, and calculations showed that the engine and two coaches must have been travelling at about 15 m.p.h. to have stopped as did those involved in the accident. Allowance must be made in applying this for the heavy retarding force due to the impact of the third coach on the bridge pier and the driver's reaction in closing the regulator.

There is no doubt that the derailment began with the trailing bogie of the third or leading bogie of the fourth coach, and it appeared from the multiple flange marks that most, if not all, the left-hand carriage



Doncaster derailment with front end of destroyed third coach in foreground

and signs of derailment and damage done to the permanent way. The two broken crossing bolts were sent for examination and analysis to the research department at Derby. Composition of the mild steel did not vary from standard in any material respect but each bolt had been broken through the screwed portion at a fatigue flaw, extending in the throat bolt for more than a quarter of the cross-sectional area. The A chair bolt had three gall marks, each about  $\frac{1}{8}$  in. deep and varying from  $\frac{1}{4}$  in. to 1 in., and was slightly bent. The throat bolt was worn smooth below the head but otherwise it appeared to be in its original condition.

The Department examined 10 throat and 12 A chair bolts of varying age drawn at random from crossings with similar traffic conditions. They were chemically cleaned and visually examined for fatigue flaws by a powerful lens. All were badly corroded and three of the throat bolts and one from an A chair were cracked at the root of the thread. Six of each type broken in service also were examined and all had growing fatigue flaws at the fracture. The throat bolts broke on the screwed portion and others at the edge of a gall mark about halfway along their length.

bridge was hit. He noticed nothing abnormal about the speed. The driver seemed to "open out" between crossover and bridge.

The driver said he made a normal start to "half of the first valve" (there is no first valve on this engine) and then notched up to 15 per cent. He wished not to accelerate too quickly and thought he passed through the crossover at about 15 m.p.h. At the bridge he opened the regulator fully. Vacuum dropped to zero and he thought the guard had applied the brakes. He closed the regulator and stopped. He felt no lurch through the crossover and no sudden jerk when the coupling between the second and third coaches parted. He knew of the 10 m.p.h. speed restriction but admitted to passing at up to 20 m.p.h. on occasion. He thought he over-estimated his speed at 25 m.p.h. at the railway inquiry. No defect was found in the engine at York that morning nor in the coaches in the brief examination at Doncaster.

The acting ganger said he examined the lines each day but had not reached the crossover. On the day before he found everything correct there. He did not notice the missing bolt in the trailing "V" cross-

wheels had mounted the rail at almost exactly the same point and that a number of right-hand wheels had dropped between the wing rails. The question arose whether the initial derailment to the left had been brought about by the failure of the wing rail supports, or whether the exceptionally steep cant gradient in relation to the speed had been responsible and the wing rail thus forced aside. It was not clear how the wing rail could be displaced by derailment to the left, so practical tests were arranged, held on a length of track of 95 lb. bullhead material to represent the line through the scissors concerned. Gradients, curvature, cross levels and gauge were reproduced as nearly as possible to the assumed conditions. A right-hand trailing crossing and left-hand check rail were laid to gauge on long crossing timbers, and packing pieces were inserted under the appropriate chairs. The marks of derailment were reproduced in paint. Two underframes on bogies of the type concerned were joined by a Buckeye coupling, to represent the third and fourth vehicles of the train. Springs were held compressed, as if loaded.

Although not truly representative of all the conditions involved the tests proved a valuable aid to the Inspecting Officers. Three were made and details of procedure are given in the report, which refers to previous cases of passenger train derailments at trailing "V" crossings, inquiries into 12 of which have been held in the present century. The details of these are listed in an appendix, with notes on a similar one in 1950, when no inquiry was held. Speeds varied from 10 to 70 m.p.h. but in every case except one the engine passed the crossing safely and some or all of the vehicles were derailed. In four of 11 cases the descriptions were not enough to indicate whether or not the opposite rail was mounted. In one of the remaining two accidents a piece was broken out of the wing rail and in the other the engine and tender mounted the opposite rail 10 yd. past the "V," the design of which was too weak for high-speed traffic and allowed too much horizontal and vertical movement of the wing rails. In the 11 cases where derailment occurred at the throat, eight were due to one or more of the fastenings being missing or broken. Two were due to worn wing rails and one to such a rail being too high. The derailments at Ferryhill on January 17, 1908, and Leeds (Wellington) on June 4, 1929, had much in common with this at Doncaster.

#### Inspecting Officers' Review and Conclusions

It is clear how the derailment began and also that some, if not all, the left-hand wheels began to mount the rail at approximately the same point, just beyond the trailing end of the check rail. The right-hand wing rail behind this point also had given way, but it was necessary to consider whether the failure of its supports was the primary cause or whether the derailment was otherwise initiated and displaced the wing rail.

The driver was much affected by his experience and, in view of the signalmen's statements and the trials described above, it is considered that not much reliance can be placed on his description of the handling of his engine, nor estimate of his speed. His earlier statement of 25 m.p.h. when the breakaway occurred probably was more correct, especially as he admitted to having passed at 20 m.p.h. when he knew 10 m.p.h. was the limit. Trials showed that residual speed on breakaway was in the region of 15 m.p.h. and likely to have been higher

at the moment of derailment. The retarding effect of the severe impact produced a pull of nearly 100 tons. Timings and actual observation confirmed that drivers were not complying with the speed restriction. It is surprising that so shortly after such a serious accident trains were found travelling twice as fast as was permissible. The conclusion is that the train was travelling at 20 to 25 m.p.h. by the time the third coach reached the crossover. A careful examination satisfied Colonel Wilson and Brigadier Langley that there was nothing amiss with engine or train; attention had to be directed to the permanent way.

An unusual feature was the steep cant through part of the scissors. The rise was so sharp it might well have produced a dangerous alteration in the loads on the bogie wheels. This is recognised in the new Railway Executive rules which do not allow more than 10 m.p.h. with a cant gradient of 1 in 81. This provides a considerable margin of safety and allows for indeterminate factors, such as minor variations in gauge, cant, rail and tyre wear and oscillation of springs, but unfavourable conditions might have been reached above 20 m.p.h. if all unfavourable factors worked together. Curvature must be taken into account. The straight path through the diamond was followed by the trailing lead on a left-hand compound curve of approximately 530 ft. radius at the point of derailment. Normal side to side oscillation of carriage bogies would have been accentuated as they negotiated the reverse curve, and a thrust to the left coupled with partial relief of weight from a left-hand wheel might have allowed a flange to mount. If, however, the damage to the right-hand trailing crossing was caused by derailment to the left a very severe flange force must have been exerted on the right-hand rail somewhere about the wing rail joint, the first point at which the wheels were free of restraint from the check rail opposite.

If speed is taken into consideration the behaviour of the vehicles at the derailment trials suggested that it was just possible that the leading bogie of the fourth coach might have spread the gauge after derailment of the preceding one. It was also suggested that damage to the wing rail might not have extended as far back as the crossing at first but have worked back as wheels dropped off. It was difficult to see how that could have happened or to explain the continuous marks on the outer face of the two leading right-hand wheels of the fourth coach, seemingly corresponding closely with the continuous heavy scoring on the inside of the wing rail beyond the throat.

Deraillments at "V" crossings usually have occurred at the throat, with evidence that wing rail fastenings were insecure. At Doncaster this rail was found to be forced away and chairs and bolts broken, but apart from a missing bolt behind the A chair and flaws in others there was no direct evidence of insecurity or weakness before the event. Rails were not seriously worn and gauge was good. Too much should not be made of former derailments as a pointer, but it cannot be overlooked that the course of this one was characteristic of those brought about by displacement of a wing rail. In seven of the eleven cases initiated at the throat the opposite wheels mounted a few feet ahead. The throat and A chair bolts were so weakened by flaws that they might have broken under traffic at any time. A key might have been loose or fallen out, as was seen to happen, and if so and the bolts became broken by the engine of the train, or the one before,

support of the wing rail would have been seriously weakened. The check rail, however, was undisturbed and its clearance varied little from standard. It had been keeping the opposite flanges away from the point and wing rails. It is unlikely that ordinary lateral flange pressure would break the wing rail. Both wing rail checking faces had been worn by flanges by  $\frac{1}{4}$  in. or more for some distance in rear of the throat.

If an axle had taken the extreme leftwards position permitted by this wear on the left-hand wing rail, support of the right-hand wheel would have been barely continuous from point rail to wing rail splay and a severe blow could be dealt by the engine and tender wheels, which might suffice to break the cracked bolts. While these rigidly held wheels might get through after such damage they and others would continue to strike the splay with increasing violence as gauge became widened progressively, until one would drop and force the opposite wheel over the rail. Certain bruises and indentations appear consistent with this. Marks suggest that the leading wheels of the fourth coach were the first to force their way into the throat. Further diversion to the left at the crossover would have sufficed to derail the rear of the third coach and carry it forward broadside to the bridge.

Making due allowance for other possibilities, the evidence points most strongly to the failure of the right-hand wing rail being the cause, not effect of the derailment and the conclusion reached by the Inspecting Officers is that the disaster was initiated by the bursting of the crossing. Although speed was considerably above that permitted, ordinarily no serious consequences would be expected from a derailment at 20 to 25 m.p.h. It was most unfortunate that the bridge was so close ahead.

#### Remarks and Recommendations

Excessive speed is not considered a major contributory cause, but the accident possibly would not have occurred had the 10 m.p.h. limit been observed. At any rate consequences would have been much less serious. Dangerous conditions could have been set up by the steep cant gradient at speeds of 20 to 25 m.p.h. The driver was at fault in failing to comply with the restriction, but had no speed indicator and such speeds may appear deceptively low on a large engine in good condition. They appear to have been accepted as commonplace and no steps had been taken to ensure that the restriction was obeyed. The sub-ganger was not paying sufficient attention to maintenance of the crossover. The permanent way inspector was aware of the 10 m.p.h. restriction, but neither he nor the sub-ganger appreciated the standard of maintenance required for heavy passenger traffic.

A crossing is an inherently weak point and its components are continually subject to severe shock loading and vibration. The standard "V" with bullhead rail has stood the test of time, but appears to have no great margin of strength under the weight of modern traffic if maintenance standards are allowed to fall. Rarity of serious derailment from crossing failure no doubt is largely due to careful regular examination and timely replacement or reconditioning of defective rails and fastenings.

The strength of a crossing depends largely on integrity of the transverse bolts. Although there is no record, the number broken annually is not inconsiderable, though low compared with the number in use, and experience does not suggest risk



from that cause to be serious. The Research Department's report indicated that generally fatigue initiates the failures. Once a crack develops a bolt is liable to break at any time under traffic. These flaws cannot be detected unless a bolt is withdrawn for special examination. This case emphasises that such failures can initiate disaster when all circumstances combine that way. It would be desirable to investigate the behaviour of such bolts and ascertain whether they should be renewed periodically, depending on character and weight of traffic or whether, given good maintenance in other respects, they can be left in position until a crossing becomes due for renewal. The transverse load on the A chair bolt is shared by the robust side brackets screwed through the base-plate to the timber, and it might also be considered whether some reinforcement could be given to the throat bolt as well, in crossings where conditions are severe, possibly by a steel yoke embracing the rail feet. This applies mainly to standard 95 and 100 lb. b.h. crossings. The new 109 lb. flat-bottom designs are much stronger in all respects.

The location of these scissors was influenced by the need to give operating space between Doncaster South and Bridge Junction and thus they came to be laid where the up main was on a 4-in. super-elevation curve, and very steep cant gradient had to be given to the slow line. It has been in existence for over 40 years, but a special restriction was recognised as desirable only four years ago. The engineering staff seem not to have realised that applying a restriction to a length of plain track where not really needed failed to focus attention on the place where it was particularly required. A 10 m.p.h. limit board has now been erected close to the crossover.

Steep cant gradients are at times unavoidable but should be eliminated wherever possible. It is suggested that similar layouts should be investigated to see whether they can be remodelled. The Bridge Junction arrangement was examined at the request of Colonel Wilson and Brigadier Langley and a scheme was prepared to replace the scissors by a simple crossover, with flatter crossings and improved cant gradient, so that 20 m.p.h. will be permissible. It is hoped this will be done without delay. Meantime the 10 m.p.h. limit will be strictly enforced.

Few locomotives here have speed indicators and reliance is placed on the driver to judge speed sufficiently accurately. Certain of the former companies were fitting indicators before the war, but some have since been removed. Future policy has not yet been decided. Such indicators would unquestionably enable drivers to obey restrictions more accurately and be welcomed by civil engineers and footplate staffs. It is recommended to fit them to new standard locomotives and, in due time, to all engines likely to be used on important passenger services.

**CLOSING OF STATIONS ON WELLS-HEACHAM BRANCH.**—On and from Monday, June 2, the passenger train service will be withdrawn from the following stations on the Eastern Region Wells-Heacham branch: Burnham Market, Docking, Holkham, Sedgford, and Stanhoe. Holkham and Stanhoe stations will be closed completely. The Eastern Counties Omnibus Company will operate a bus service between Heacham and Wells, and also between Hunstanton and Wells. Railway Executive cartage services will continue for parcels traffic.

## Parliamentary Notes

### Dieselisation of Branch Lines

On the motion for the adjournment of the House of Commons on April 4, Major Niall Macpherson (Dumfries—Nat. Lib. Con.) urged the use of diesel railcars on branch lines, which, he said, should not be closed for passenger traffic. He cited the G.N.R.(I.) as a case where considerable economies had been realised through use of railcars, besides the former G.W.R. and some European and overseas railways. A start is dieselising branches should be made in Scotland.

Mr. Gurney Braithwaite (Parliamentary Secretary to the Minister of Transport) explained what had been done to provide alternatives for passenger and goods services withdrawn from certain Scottish branches. The railways had been realistic in withdrawing the passenger services because passengers were road conscious. Closing branch lines had saved £800,000 for British Railways in 1951. Diesel railcars would not sufficiently have revived passenger traffic.

### Dieselisation Policy

British Railways, he continued, had not yet sought to order diesel railcars because of the severely limited capital investment programme, and available technical staff had been fully employed on the electrification schemes.

The railways were fully aware of the scope for diesels in replacing lightly-loaded steam services. This year a special committee was formed to investigate the whole problem. Their findings were now being fully considered by the Railway Executive and would be made known to the B.T.C. with a recommendation from the Executive on expenditure and also, perhaps, to Parliament.

Continuing, Mr. Braithwaite said the Railway Executive told him that railcars had long been studied and there was nothing that was not known about their design, equipment, operation, and maintenance. Full information was available of Continental and overseas experience. No doubt investigations would be steadily pursued with a view to expanding diesel services as the financial position allowed.

## Questions in Parliament

### Defence Orders for Railway Workshops

Major S. F. Markham (Buckingham—C.) on April 3 asked the Minister of Supply, what orders had already been placed by him with British Railways carriage or locomotive works; and what steps were being taken to ensure the fullest co-operation in this field.

Mr. A. R. W. Low (Parliamentary Secretary to the Ministry of Supply) wrote in reply: Rearmament work has already been placed by the Ministry of Supply with the locomotive shops at Horwich, and coaching stock is being sent for overhaul to Wolverton.

Replying to a similar question regarding Derby Works by Mr. A. J. Champion (South East Derbyshire—Lab.) on April 7, Mr. Duncan Sandys (Minister of Supply) wrote that defence orders would be allocated to Derby, as well as elsewhere, when there was suitable work for which it is necessary to supplement existing industrial capacity.

Major S. F. Markham once again, on April 9, asked the Minister of Transport whether, in view of the necessity for railway

workshops to give the greatest possible assistance to rearmament, and the confused circumstances that seemed to arise through the provisions of Section 2 (2) (iii) of the Transport Act, 1947, he would introduce legislation abolishing that subsection completely.

Mr. J. S. Macley stated in a written answer: As authority can be, and has in one instance been, given by a Direction under Defence Regulation 55 (2A), the amendment suggested does not seem necessary.

## The Transportation Club

The annual general meeting of the Transportation Club was held at 44, Wilton Crescent, S.W.1, on April 9. Major-General G. S. Szlumper, the Chairman of the Club, presided.

After recording the deep regret of the members at the death of Mr. W. S. Graff-Baker, a Member of Council, the Chairman dealt briefly with the financial position of the Club. He said that the fact that the net increase in general expenditure had been only £456 against a considerable increase in gross takings was a testimonial to the way in which the Honorary Secretary ran the Club and the staff backed up his efforts.

The loss on working for the year had been £981 and, although this was less by £779 than that of the previous year, the state of the finances left no room for optimism. The number of members was 528 as against 452 at the end of 1950.

The report and accounts were adopted.

## Contracts & Tenders

Coras Iompair Eireann has recently placed a contract with John Thompson Motor Pressings Limited, Wolverhampton, for 100 carriage underframes.

The Canadian National Railways have ordered four diesel locomotives from the Canadian Locomotive Co. Ltd. for the railway under construction between Sherridon and Lynn Lake, Northern Manitoba.

The Government of Mexico has recently announced the purchase of diesel locomotives and other rolling stock to the value of ps. 38,000,000, reference to which was made in our April 11 issue. The contract is placed with Linke-Hoffmann-Busch, Germany, and payment will be made within three years of arrival of the equipment in Mexico.

A German group representing Linke-Hoffmann-Busch is pursuing negotiations with the Mexican Government for additional equipment, which may total some ps. 200,000,000. Germany is expected to sell Mexico equipment for the projected goods wagon works to be established with the aid of Nacional Financiera, as well as various other items of machinery and rails.

The Westinghouse Electric International Company, U.S.A., has recently received an order for complete 1,600 h.p. electrical traction units for 32 diesel-electric all-service locomotives to be built by the Baldwin-Lima-Hamilton Company. The locomotives, which are for the Central Railway of Brazil, will be driven by traction motors mounted on each of the six axles and will be capable of hauling 2,000 trailing tons on a level. Twenty of the locomotives are for the 1.6 m. gauge and twelve for metre-gauge lines. Delivery of



the electric traction units is expected to begin in January, 1953.

The Swiss Federal Railways have recently placed orders for a large number of passenger carriages, restaurant cars and railcars with the following companies: Schindler Wagon A.G., Pratteln; Swiss Car & Elevator Manufacturing Corporation Limited, Schlieren-Zurich; Société Industrielle Suisse, Neuhausen-Rhine Falls; Brown, Boveri & Co. Ltd., Baden; Ateliers de Construction Oerlikon, Zurich-Oerlikon; Swiss Locomotive & Machine Works, Winterthur; S.A. des Ateliers de Secheron, Geneva.

The Board of Trade, Special Register Information Service, has stated that the Government of Pakistan, Ministry of Communications, Railway Division, has issued a call for tenders for the supply of:—

Five metre-gauge oil tank wagons, "MBTOX" type, with hand pump.

14 metre-gauge molasses and water tank wagons, "MBTOX" type, without hand pump.

The wagons are to be complete with underframe, vacuum-brake fittings, draw gear and buffing gear. Tenders should reach the Office of the Director General, Railways, Railway Division, Ministry of Communications, Karachi, by mid-day on May 19. They will be opened in the Office of the Director of Mechanical Engineering & Stores, Railway Division, Ministry of Communications, Government of Pakistan, Karachi, at 11 a.m. on May 20, in the presence of any tenderer who may desire to be present.

A copy of the tender documents is available for inspection by representatives of United Kingdom manufacturers at the Board of Trade, Commercial Relations & Exports Department. Further copies of the tender documents and particular specifications can be obtained from the Office of the Director General, Railways, Railway Division, Ministry of Communications, Karachi, on payment of Rs. 100 a set.

A further report from Karachi states that the Government of Pakistan has issued a call for tenders for the supply of the following:—

18 broad-gauge diesel-electric locomotives.

Two broad-gauge inspection diesel railcars, complete with diesel engine transmission driving gear, underframe, vacuum brake fittings, draw gear, and buffing gear.

Tenders should reach the Office of the Director General, Railways, Railway Division, Ministry of Communications, Government of Pakistan, Karachi, by 12 noon on May 23. Copies of the tender documents are available for inspection by representatives of United Kingdom manufacturers at the Board of Trade, Commercial Relations & Exports Department. Further copies of the tender documents and particular specifications can be obtained from the Office of the Director General, Railways, Karachi.

#### IMPROVED VESSEL FOR SKYE FERRY SERVICE.

—A new and improved type of ferry vessel was brought into use by the Scottish Region in time for Easter traffic on the Kyle of Lochalsh-Kyleakin (Isle of Skye) ferry service. The vessel was built by Wm. Denny & Bros. Limited, Dumbarton, and launched in September, 1951. It is named *Portree*, and has been designed to carry four motorcars and approximately one hundred passengers at each crossing. Two Gleniffer four-cylinder 80 h.p. high-speed diesel engines provide a speed of about 9 knots.

## Notes and News

**Vacancy for Chief Boiler Inspector.**—Applications are invited for the post of chief boiler inspector required by a British railway company operating in Chile and Bolivia. See Official Notices on page 447.

**Railways and Coal.**—At a joint meeting of the Institute of Fuel and the Institution of Locomotive Engineers on May 1, Mr. R. G. Jarvis will read a paper on "The Railways and Coal." The meeting will be held at the Institution of Mechanical Engineers, Storey's Gate, S.W.1, at 5.30 p.m.

**Churchill Machine Tool Co. Ltd.**—Treasury approval has been given to the capitalisation by the Churchill Machine Tool Co. Ltd. of its reserves to the extent of £263,760; this sum to be used in paying up in full 263,760 ordinary £1 shares for distribution among ordinary stockholders in the proportion of one new share for each £1 of ordinary stock held. The necessary resolutions will be submitted at the company's forthcoming meeting.

**L.M.R. (London) Orchestral Society.**—British Railways, London Midland Region (London) Orchestral Society, which is now in its thirtieth season, will give a Spring concert on Friday, April 25, in the Friends House, Euston Road, London, N.W.1. The programme for the orchestra, leader Mr. George Elmitt, with Miss Corinne Belden (soprano) and Mr. Percival Garratt (solo pianoforte), will include symphony No. 6 (Pathétique), the suite from the ballet "Lac des Cygnes," and the "Letter Song," by Tchaikovsky, and the concerto in C minor by Mozart.

**Iron and Steel Production in March.**—Steel production in March, at the annual rate of 16,648,000 tons is slightly above the rate of 16,546,000 tons for March last year. Pig iron production has increased to the highest monthly rate yet achieved of 10,478,000 tons a year, compared with 9,572,000 tons in March, 1951. The British Iron & Steel Federation states that coke supplies are still inadequate for the needs of the blast furnaces; stocks were drawn on heavily in March and the total stocks at blast furnaces recently represented only four days' supply.

**Permanent Way Institution, London Section.**—On Saturday, May 17, the Permanent Way Institution, London Section, will inspect the extensive sea defence works in hand adjacent to the Southern Region main line between Folkestone and Dover. The party will leave Charing Cross Station at 9.15 a.m. for Folkestone, and the inspection will take place before lunch. During the afternoon a visit will be made to the Romney, Hythe & Dymchurch Railway. The return journey will be from New Romney to Charing Cross, where the party is due to arrive at 8.41 p.m.

**Manila Rail Bonds Settlement Move.**—Mr. Pio Pedrosa, President and General Manager of the Manila Railroad Company, has disclosed that he has sent to the office of Economic Co-ordination a formula for early settlement of the company's bonds now held by British and American holders. Mr. Pedrosa said that the foreign bondholders should share in the losses incurred by the company during the war. A settlement of the bonds should be effected as soon as possible, as they were weighing down improvements in

the railroad, and the accumulating interest on them distorted the company's finances. The Manila Railroad for the past eleven years has paid no interest on the \$13,236,000 of its five per cent. bonds, held by the Manila Railway Company of London. The American holders were getting their interest paid regularly, Mr. Pedrosa said, but this cost the company only about \$15,000 a year, as the outstanding amount of the American-held bonds was small.

**Coal Production.**—Output of coal during the week ended April 5 was the highest so far in 1952. Every coalfield, except six in Scotland where there was no Saturday work, contributed. Deep mine production was 4,506,900 tons, an improvement of 113,000 tons on the previous week and of 84,000 tons on the corresponding period last year.

**Central Uruguay Railway Co. of Monte Video Ltd.**—A general meeting is to be held at River Plate House, London, E.C.2 at 11 a.m. on May 1, to consider the liquidators' acts and dealings and conduct of the winding up during the year ended February 23, 1952, and also to fix the remuneration of the liquidators. The meeting is convened to comply with the Companies Act, 1948, but the ordinary stockholders have received the maximum that they are entitled to under the Scheme of Arrangement, any surplus being payable to the 5 per cent. Second Debenture stockholders.

**British Railways Easter Traffic.**—British Railways report that in addition to the heavy Easter passenger traffic, they cleared 406,640 tons of coal from deep-mined pits and open-cast sites during the 72 hours ended 6 a.m. on April 15, bringing the total for the last eight days up to 3,038,470 tons. (Figures for the corresponding periods at Easter, 1951, were 361,370 tons and 2,970,100 tons respectively). During the week ended April 5, 203,393 tons of iron and steel were conveyed from the principal steel works. Over 2,000 relief trains were run for Easter passenger travel. On the three busiest days, 1,340 long-distance trains carried 433,000 passengers out of the London termini alone.

**Gas Turbine Locomotive at B.I.F.**—A 10-mm. scale model of the Western Region gas turbine locomotive, No. 18100, will be shown at the British Industries Fair on the stand of the Metropolitan-Vickers Electrical Co. Ltd., the maker of the traction equipment. Among other exhibits of the company will be a 66 kV., 800 A., 1,000 MVA outdoor oil circuit-breaker embodying numerous improvements in design. The tank has been designed to reduce the quantity of oil required and the tank handling arrangements are a considerable advance on the winding method adopted earlier. Metrovick industrial motors will be represented by a 50-h.p., 500-r.p.m. totally-enclosed d.c. steelworks motor.

**Model Railway Club Exhibition.**—Over 3,000 models are on show at the 1952 exhibition of the Model Railway Club, which opened at Central Hall, Westminster, on April 15. The exhibition, which is open from 11 a.m. to 9 p.m. until tomorrow, April 19, includes all the principal features of former years, as well as a number of additions. In the lower hall Mr. William Banwell is showing a Great Central garden layout from his home at Stanmore. Another interesting working

## OFFICIAL NOTICES

The engagement of persons answering Situations Vacant advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

**CHIEF BOILER INSPECTOR** required by British Railway Company operating in Chile and Bolivia. Only candidates with Railway training and experience should write to—Box 5762 c/o CHARLES BARKER & SONS LTD., 31, Budge Row, London, E.C.4.

**RUNNING Superintendent** for the Southern Railway of Peru, must have served apprenticeship railway workshop and ten years' experience as an administrative and technical officer. Knowledge of Spanish desirable. Must be under 50 years of age. Apply Secretary, THE PERUVIAN CORPORATION LIMITED, 144, Leadenhall Street, London, E.C.3.

**FOR SALE.** Hangar (all steel) 113 ft. clear span × 135 ft. long × 25 ft. clear height at eaves, rising to 35 ft. clear at apex. Doors each end (gable optional). Hangar (all steel) 80 ft. clear span × 144 ft. long × 22 ft. clear height at eaves, rising 32 ft. at apex. Doors one end. Steel building 80 ft. clear span × 144 ft. long × 22 ft. clear height at eaves. Large sliding doors in sides. Curved steel building 35 ft. span × 17 ft. 6 in. high at apex. Up to 600 ft. long (low price).—BELMAN HANGARS LTD., Terminal House, London, S.W.1.

**JUNIOR TRAFFIC OFFICIAL** with Railway Traffic apprenticeship experience required for the Southern Railway of Peru, age 20/25 years, single, knowledge of Spanish would be an advantage. Apply to the SECRETARY OF THE PERUVIAN CORPORATION LIMITED, 144, Leadenhall Street, London, E.C.3.

**RATE FIXER** required by old established Midland firm. Applicants must be experienced in medium heavy engineering. Preference will be given to men possessing knowledge of locomotive work. Send details of previous employment and salary required to—W. G. BAGNALL LIMITED, Castle Engine Works, Stafford.

**YOUNG Engineer** wanted with commercial experience or leanings, or alternatively, young commercial man with technical leanings, for work overseas after training period. Applicant should be ambitious young man anxious to get on, and a good mixer. Work involves sale of engineering products to plantations, mines, contractors, etc., and offers excellent career to right man. Send typed application with photograph, which will be returned, to Box 329, FROST-SMITH ADVG., 64, Finsbury Pavement, London, E.C.2.

**JUST PUBLISHED.**—Twenty-Five Years of the North Eastern Railway, 1898-1922. By R. Bell, C.B.E., Assistant General Manager, N.E.R., and L.N.E.R. Companies, 1922-1943. Full cloth, Cr. 8vo. 87 pages. 10s. 6d.—The Railway Gazette, 33, Tothill Street, London, S.W.1.

**AN experienced Carriage & Wagon Draughtsman** required by Cambrian Wagon Works Limited, Cardiff. Housing accommodation available.

**WE BUY** used or unserviceable Steel Files at good prices in lots of 2 cwt. or more.—THOS. W. WARD LTD., Reusable Steel Dept., Albion Works, Sheffield.

**CIVIL ENGINEERS,** preferably with Railway Experience. Reply: Stating qualifications and salary required to—EAGRE CONSTRUCTION CO., LTD., East Common Lane, Scunthorpe.

**LOCOMOTIVE, CARRIAGE and WAGON SENIOR DRAUGHTSMAN** 30/35 years of age. Qualifications: Must have served a full general apprenticeship in an Engineering workshop (preferably Railway) and have had at least five years' drawing office experience with some time in an executive capacity. A knowledge of Spanish an advantage. Future prospects. Apply to the Secretary, PERUVIAN CORPORATION LIMITED, 144, Leadenhall Street, London, E.C.3.

**BOUND VOLUMES.**—We can arrange for readers' copies to be bound in full cloth at a charge of 25s. per volume, post free. Send your copies to the SUBSCRIPTION DEPARTMENT, Tothill Press Limited, 33, Tothill Street, London, S.W.1.

layout is a "000" gauge railway, with many lineside features, which is to the smallest scale at present in use and was built by Mr. H. B. Whall and Captain Cyril Provo in six months. British Railways model layout now includes a class "5" 4-6-0 and the station has been enlarged. The passenger-carrying steam locomotives and many pre-grouping and former main-line company models are again among the most popular attractions of the exhibition.

**Skefko Capital Increase Proposal.**—The Directors of the Skefko Ball Bearing Co. Ltd. announce that at the annual general meeting of the Company to be held on April 29, stockholders will be asked to agree to an increase in the authorised share capital of the Company from £1,000,000 to £1,500,000. The directors have no immediate intention of issuing additional capital.

**Dismantling the Dome of Discovery.**—The dismantling of the Dome of Discovery and ten other buildings at the Festival of Britain site has been entrusted to George Cohen Sons & Co. Ltd. Preparatory work will begin immediately. Jones "KL" mobile cranes with specially long jibs will be used for the task. These cranes are manufactured by K & L Steel-founders & Engineers Limited, of Letchworth, also members of the 600 Group of companies.

**Railway Castings at B.L.F.**—Examples of railway rolling stock fittings similar to items ordered for the Pakistan railway system will be on view at the stand of Hale & Hale (Tipton) Limited at the Castle Bromwich Section of this year's British Industries Fair. Experience has shown the potentialities of castings in Blackheart malleable iron and in Permalite, the recently-developed high duty alloy, as reliable and less expensive alternatives to steel for a wide range of parts. An important section of the company's foundries is now dealing with orders for castings for railways, including vacuum brake couplings, permanent way fittings, spring housings, carriage and van fittings, and many parts for electric railways. Apart from

the large current order from Pakistan, the company is supplying fittings for home, Colonial and foreign railways. Extensive development plans are in hand at the foundries which will help to meet requirements of railway engineers, although at the present time defence contracts have priority.

**Landslide on Estoril Railway.**—Ten passengers were stated to have been killed and some 50 injured on March 31 when an electric train of the Estoril Railway, Portugal, on its way from the seaside resort of Cascais to Lisbon, was struck by a landslide at a point some six miles from the city. Heavy rains had dislodged rocks above the line.

**Australian Wage Claims.**—On April 3 the Australian Railways Union served a demand on the Railway Commissioners of four States for a basic wage of £A20 a week, with margins of £A10 to £A14 for tradesmen. Acceptance of the demand would mean that all railway tradesmen in Victoria, New South Wales, South Australia, and Tasmania would receive a minimum wage of £A30 for a 35-hr. week. The Railway Commissioners in Victoria have referred the demand to arbitration.

**Institute of Welding Spring Meeting.**—The Institute of Welding is holding its Spring meeting in Glasgow on April 24, 25 and 26. On the first day a limited party will visit the Linwood Factory, Paisley, of the Pressed Steel Co. Ltd., and the Cambuslang Works of Colvilles Limited. The presentation and discussion of technical papers will occupy the mornings of April 25 and 26. Papers to be presented are:—"The Construction of a High-Speed Wind Tunnel," by Mr. J. H. Bell; "Some changes in the Shipyard, with Particular Reference to Oil Tanker Construction," by Mr. J. Rannie; "Welding in Hydro-Electric Plant," by Mr. J. Crawford; "Lightweight Welded Construction in Mechanical Engineering Structures," by Mr. F. Koenigsberger. On the afternoon of April 25, there will be a choice of works visits to Sir William Arrol & Co. Ltd., John Brown & Co. Ltd., and Harland & Wolff Limited. Social engagements in-

clude a day excursion for ladies on April 25 and a dinner that evening, at which the Lord Provost will be represented. Mr. Howard J. Thompson, President of the Institute, will preside over the meetings.

**Southern Region Halt to Close.**—British Railways, Southern Region, will close High Rocks Halt to passenger traffic on and from Monday, May 5. High Rocks Halt is situated between Tunbridge Wells West and Groombridge. The halt had been closed previously, and re-opened on June 15, 1942.

**Stephenson Locomotive Society.**—The forty-third annual general meeting of the Stephenson Locomotive Society was held at the Society's headquarters, 32, Russell Road, London, W.14, on April 5, under the chairmanship of Mr. A. J. Boston, who was supported by Mr. J. N. Maskelyne, President, executive officers, and representatives from provincial areas. Membership increased considerably during the year and the special train tours which the Society has organised continue to be popular. Mr. W. Beckerlegge was elected a Vice-President.

**Permanent Way Institution.**—The 1952 Summer Convention of the Permanent Way Institution will be held at Ipswich between June 14-19. On Saturday, June 14, there will be a Council Meeting at the Town Hall, Ipswich, followed in the afternoon by the annual summer general meeting. The summer dinner will be held at 6.30 for 7 p.m. on June 14 and Lt.-Colonel H. B. Everard will preside. There will be all-day visits to Norwich, Colchester and Lowestoft and provision has been made for the inspection of a number of works of transport and industrial interest. Alternative arrangements have been made for ladies, with tours of local scenery.

**Transfer of Provincial Bus Services.**—As from May 1, 1952, the Midland Area of the Eastern National Omnibus Co. Ltd., involving the bus services operating from Bedford, Luton, Aylesbury, Huntingdon, Hitchin and Biggleswade, will be transferred to the United Counties Omnibus Co. Ltd. and will come under the management

of that company, whose head office is at Houghton Road, Northampton. No immediate alterations will be made in the existing timetables. At the same time, the management of the express service operated by the United Counties Omnibus Co. Ltd. between Oxford and London will be transferred to the South Midland Omnibus Co. Ltd.

**Traction Battery Exhibits.**—D.P. Kathanode traction cells will form the principal exhibit on the stand of the D.P. Battery Co. Ltd. at this year's B.I.F. These batteries are being fitted in increasing numbers to provide motive power for battery-electric road vehicles, industrial trucks, and locomotives. Examples will be shown of battery units of the specially designed Kathanode type used extensively at home and abroad for diesel engine starting on railway locomotives. Other cells of various types from the D.P. stationary battery range will include units for emergency lighting, railway signalling, and radio transmission.

**New Station for Clydebank Housing Scheme.**—It is planned to build a station between Drumchapel and Singer on the Glasgow-Dumbarton-Helensburgh line of the Scottish Region to serve the growing residential estate lying to the north-east of the burgh of Clydebank. The station is to be named Drumry; a convenient train service will be provided to and from Glasgow Queen Street, Bridgeton Cross, Dumbarton, Balloch, and Helensburgh. The main buildings will be located on the up, or Glasgow departure, platform, and will comprise passenger accommodation, booking office, and staff rooms. A reinforced concrete canopy will extend over part of the platform. Access to the station will be provided from either side of the railway. Work on the foundations of the station will begin shortly.

### Forthcoming Meetings

April 19 (Sat.) to 27 (Sun.).—Stephenson Locomotive Society, Spring tour of Scottish railways and motive power depots.

April 22 (Tue.).—Institute of Transport, Informal Luncheon, at the Connaught Rooms, Great Queen Street, W.C.2, at 12.30 for 1 p.m. Address by Major R. H. Thornton, Director, Alfred Holt & Co. Ltd., and Member of the Board of B.O.A.C.

April 23 (Wed.).—Institute of Fuel, at the Institution of Mechanical Engineers, Storey's Gate, S.W.1. Annual corporate meeting at 4.30 p.m., and Presidential Address "Fuel Technology and Civilisation," by Dr. G. E. Foxwell, at 5.30 p.m.

April 24 (Thu.).—Institute of Fuel. Annual Luncheon, at the Connaught Rooms, Great Queen Street, W.C.2, at 12.30 for 1 p.m. Principal guest and speaker, Sir John Hacking, President, Institution of Electrical Engineers.

April 25 (Fri.).—Institution of Mechanical Engineers, Storey's Gate, S.W.1, at 5.30 p.m. Discussion: "Explosions in Enclosed Crankcases of Reciprocating Engines, their Cause, Effect and Possible Remedy," by Mr. John Lamb.

April 25 (Fri.).—Inter-Allied Railway Club, Paris, Annual Gala and Ball "La Nuit Européenne de la Locomotive," at the Aero-Club, Paris, at 10 p.m.

April 26 (Sat.).—Railway Students' Association. Visit to Parkeston Quay and Harwich.

## Railway Stock Market

There has again been a better tendency in stock markets. A further rise in British Funds was the main feature, and buyers generally were more in evidence. British Funds have now rallied to their best level since the Budget, when the increase in the bank rate affected sentiment; and the tendency is for leading industrial shares to take their cue from the trend in gilt-edged. Firmness of the pound in relation to the U.S. dollar has helped sentiment as to gilt-edged, and also the view that another increase in the bank rate will not be necessary. It is being assumed that over the next few months there will be further indications that the steps already taken by the Government to check inflation are effective.

There are continued hopes in the City that before the Finance Bill becomes law, the Chancellor of the Exchequer will agree to some amendments to the E.P.L. proposals, though only minor amendments are likely to be accepted. The improvement in industrial shares has been due in part to the belief that the recent sharp falls had been carried too far because of a tendency to exaggerate the effects of E.P.L. Nevertheless, the new tax will bear unfairly in many cases, and many companies sooner or later will have to consider how to raise additional capital.

Foreign rails displayed rather more activity, though price movements were generally small and indefinite. The further payment in respect of arrears put Antofagasta preference better at 65½, while the ordinary stock firmed up to 14½.

Canadian Pacific remained an active feature on further consideration of the annual accounts, and sentiment was also helped by the Canadian budget, but at \$69½, a further part of the recent advance was lost. The strength of the Canadian Pacific financial position drew attention to the investment merits of the 4 per cent. debentures and 4 per cent. preference stocks, which improved to 77½ and 64½ respectively.

Leopoldina ordinary was 11½ and the preference 28½, while Leopoldina Terminal debentures further strengthened to 20½ and the ordinary units attracted some speculative attention around 8½d.

Manila "A" debentures have been firmer at 65½ and the preference shares were 6s. 10½d. Brazil Rail bonds were 5½

and San Paulo 10s. ordinary units firmed up to 13s. 4½d. United of Havana stocks became rather more active with the 5 per cent. (1906) debentures better at 17½.

Mexican Central "A" debentures were 76½. Nitrate Rails shares were 22s. 6d. and Taltal 17s. 3d. Chilean Northern 5 per cent. first debentures changed hands up to 36.

Cordoba Central Trust "B" debentures marked 35, and Costa Rica 6½ per cent. first debentures 45½d. Dorada ordinary stock changed hands at 40, and Guayaquil & Quito 5 per cent. first debentures at 34½.

In the road transport and allied sections B.E.T. deferred stock again rose sharply to £405 on the prospect of de-nationalisation in road haulage. West Riding improved to 33s., Southdown were 77s. 6d., and Lancashire Transport 42s. 6d. x d.

Engineering and kindred shares have participated in the better trend of markets. There was more general recognition of the good yields at current prices and a belief that there are good prospects of dividends maintained despite E.P.L.

Guest Keen at their improved level of 49s. 6d. still yield virtually 5½ per cent., and there are hopes that the total dividend may be raised from 14 to 15 per cent. for the past year. Tube Investments at 5½ have responded to the share bonus news which came as a surprise to the market. T. W. Ward were firm at 69s. 9d., Ruston & Hornsby 32s. 9d., and British Aluminium at 40s. 9d. have responded further to the higher payment.

Cammell Laird 5s. units at 12s. 3d. reflected the strong position disclosed by the full accounts, which show a big increase in liquid resources arising from the surplus on the transfer of the company's English Steel holding to the Iron & Steel Corporation. There is apparently to be no special distribution to shareholders from this surplus because of the prospect of de-nationalisation and perhaps an opportunity to buy back steel interests.

Beyer Peacock were 29s. 3d., Hurst Nelson strengthened to 47s. 6d., Birmingham Carriage were 32s. 6d., and Vulcan Foundry rose to 23s. in anticipation of the results. North British Locomotive were 16s. 7½d., Gloucester Wagon 12s. 1½d., Wagon Repairs 11s. 3d. and Charles Roberts 20s. 9d.

### Traffic Table of Overseas and Foreign Railways

Railway	Miles open	Week ended	Traffics for week		No. of week	Aggregate traffics to date				
			Total this year	Inc. or dec. compared with 1949/50		Total	Increase or decrease			
						1950/51				
Canada South & Cen. America	Antofagasta ...	811	4.4.52	£ 180,700	+	£ 55,510	14	£ 2,139,950	+	£ 786,900
	Costa Rica ...	281	Jan., 1952	cl. 495,633	+	c340,108	31	c8,756,306	+	c1,420,052
	Dorada ...	70	Feb., 1952	35,330	+	3,014	9	69,700	—	4,173
	Inter. Ctl. Amer. ...	794	Feb., 1952	\$1,184,770	—	\$48,689	9	\$2,500,507	—	\$48,296
	Paraguay Cent. ...	274	28.12.51	G289,547	+	G102,688	26	G8,823,911	+	G3,556,978
	Peru Corp. ...	1,050	Mar., 1952	\$8,659,000	+	\$756,000	39	\$74,638,000	+	\$5,967,000
	" (Bolivian Section) ...	66	Mar., 1952	Bs.19,081,000	+	Bs.4,871,000	39	Bs.145,347,000	+	Bs.34,880,000
	Salvador ...	100	Jan., 1952	c329,000	+	c15,000	31	c1,212,000	+	c129,000
	Taltal ...	147	Mar., 1952	\$2,436,000	+	\$345,000	39	\$19,893,000	+	\$5,205,000
	Canada	Canadian National†	23,473	Feb., 1952	17,346,000	+	2,895,000	9	34,503,000	+
Canadian Pacific†		17,037	Feb., 1952	11,775,000	+	1,457,000	9	23,309,000	+	2,475,000
Various	Barsi Light* ...	167	Feb., 1952	36,960	+	3,945	48	369,540	+	50,557
	Gold Coast ...	536	Feb., 1952	297,888	+	19,649	47	3,152,908	+	299,560
	Mid. of W. Australia ...	277	Jan., 1952	58,380	+	16,390	31	415,958	+	138,744
	South Africa ...	13,398	22.3.52	2,031,334	+	211,620	51	97,751,061	+	9,635,645
	Victoria ...	4,744	Nov., 1951	2,143,056†	—	—	22	—	—	—

\* Receipts are calculated at 1s. 6d. to the rupee

† Calculated at \$3 to £1

‡ No comparison with November, 1950, when, due to a strike, services did not operate